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O. P. BRYSCH, Editor

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1. MANAGEMENT

Gas Industry Rank

Bureau Analyzes Size of Gas Industry. *A.G.A. Monthly 40,* 19 (1958) Jan.

Based on net capital investments the gas industry ranks as the nation's fifth largest, according to recent information from Internal Revenue Service records. The A.G.A. Bureau of Statistics has used a composite of revenues and investments for a more accurate determination. Findings: gas industry is the nation's eighth largest, preceded by the following, in order: banks and trust companies, life insurance companies, petroleum refining, electric light and power, railroads, telephone and motor vehicle production.

Gas Industry Research

An Industry Perspective from the Research Planning Viewpoint. M. Gorland. *A.G.A. Monthly 40,* 17 (1958) Feb. (4 pp.)

Management interest must be educated toward research if the amount of research conducted by the gas industry is to grow. Transmission and distribution fields lend themselves to cooperative efforts. Continuously increasing price of gas at the well necessitates improved efficiency in transportation and delivery if price is to remain competitive at customer destination. Sobering note: wholesale price index for natural gas has risen approximately 18% since 1950; within the same period, electrical index has fallen some 5%.

Gas and Electric Costs

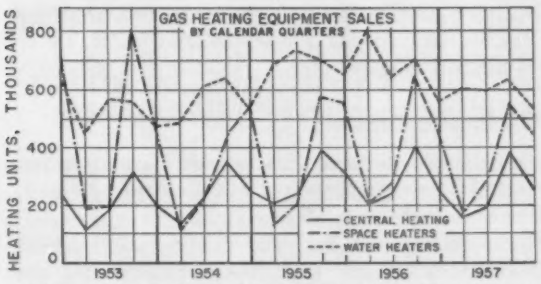
The Zinder Report. *Am. Gas J. 185,* 18 (1958) Mar. (4 pp.)

Interview with C. A. Brandt, author of "Zinder Report," (see *Gas Abstracts 14,* 26) discloses how gas industry can best use this report which measures comparative costs of utility services. Gas industry can benefit if it gets the report to men who design housing projects, assists project planners in preparing estimates of fuel consumption, electric demands and operating costs, and if it obtains additional field data to check factors in the report and to reinforce by proved facts the economic advantage of gas over other fuels.

Federal Control

Federal Regulation of Gas Production Is Here to Stay. C. Lyons. *Gas Age 121,* 34 (1958) Feb. 20 (3 pp.)

Congress is considering the Harris Bill, non-passage of which means that any new bill will subject production to measure of control. Choice is between utility-rate-base concept or Harris Bill. However, there also are urgent reasons for opposing the Staggers Bill. This bill would bring under Federal regulation all gas sales made by pipelines directly to industrial consumers. Such sales would be governed by the same certificate and rate provisions that apply to sales for resale.



(*Adapted from* Industry Sales Strong at Year-End, *below.*)

Heater Sales

Industry Sales Strong at Year-End; Central Installations Off 10%. *Gas Heat and Comfort Cooling 9,* 12 (1958) Feb.; *ibid.,* 33, Mar. (11 pp.)

Central gas heating equipment sales totaled 986,180 units in 1957, 110,930 less than the year before. Gas water heater sales totaled 2,368,085, off 12% according to preliminary estimates. Retail sales of floor furnaces were off 19%; wall furnace sales were down 1% and space heater sales were off 6.6% during 1957. Only gas unit heater sales showed an increase—3.5% for the year.

Field Gas Prices

What's the Price of Gas? H. D. Ralph. *Oil Gas J. 56,* 110 (1958) Mar. 10 (5 pp.)

Single price does not exist, but for the first time figures have been compiled on actual field prices and factors that determine them. Federal Power Commission may or may not use this study in determining producers' prices, but it contains much important information for gas industry.

U.S. Oil Activities

United States. *World Petrol. Report* (An Annual Review of International Oil Operations) *4,* 59 (1958) Jan. 15 (4 pp.)

Exploration in U.S. during 1957 dropped by about 4000 wells or 9%. Production held at 7,150,000 bbl/day after post-Suez slump and is expected to hold at this rate during 1958. Refinery capacity was up about 200,000 bbl/day to total 9,157,700 bbl/day. Total demand rose to about 9,300,000

bbl/day, an increase of about 100,000 bbl/day. Pipeline construction totaled 142,686 miles, an increase of 10%.

Oil Import Controls

Associations Endorse Principle of Mandatory Import Controls. *Independent Petrol. Assoc. Monthly 28,* 31 (1958) Feb. (2 pp.)

Representatives of state and regional oil producer associations adopted a resolution commending and endorsing the announced policy of the Independent Petroleum Association of America to seek congressional action regarding mandatory controls of excessive oil imports.

World Oil Operations

World. *World Petrol. Report* (An Annual Review of International Oil Operations) *4,* 13 (1958) Jan. 15 (6 pp.)

General summary and forecast of world conditions indicates that; exploration is rising—will hit new high outside U.S.; production rose only 6% to 17,647,000 bbl/day in 1957; refining capacity, up 1.9 million bbl/day in 1957, may rise 2 million bbl/day in 1958; transportation surplus in tankers, pipeline construction is high; consumption increased only 7% in 1957 and estimates are that another 7% increase is likely for 1958; oil laws were passed in three countries and are pending in three more; government trend toward increased participation in exploitation is rising.

European Oil

Outlook Good for Better European Oil Supplies. *Gas World 147,* 380 (1958) Feb. 22 (4 pp.)

Outlook bright regarding the opening of new oil fields in O.E.E.C. countries. Increased European production might be achieved if all member countries adopted any administrative and legislative measures likely to give greatest stimulus to prospecting and exploitation and if, at government level, wide cooperation could be established between technical bodies and associations.

Sahara Exploration

Sahara Push Gets Boost as U.S. Firms Join Oil Hunt. *Petrol. Week 6,* 50 (1958) Mar. 14 (2 pp.)

Sahara oil exploration, already a $100-million-a-year proposition, is due for a boost this year as new oil groups, including Cities Service, Phillips Petroleum, Sinclair Oil and Newmont Mining, get into the desert oil push. First two companies have already established rights.

LPG Market

Market Research and Prospecting. M. A. Brower. *Butane-Propane News 20,* 38 (1958) Mar. (4 pp.)

Five types of information are needed for complete and effective market planning: location, size, characteristics, trend of demand and effectiveness of efforts of both company conducting the survey and its competitors.

Load Factor

Are You Overlooking Hidden Revenue Dollars in Gas Air Conditioning Load? D. M. Mayne. *Am. Gas J. 185,* 22 (1958) Mar. (2 pp.)

Company's earning rates can be increased by indirect benefits — revenue-less-cost-of-gas resulting from improved load factor (and its attendant lowering of demand cost).

Civil Engineering

Civil Engineering Design in the Gas Industry. D. A. Andrews. *Gas J. 293,* 434 (1958) Feb. 26 (6 pp.); Trends of Civil Engineering Design in the Gas Industry. *Gas World 147,* 432 (1958) Mar. 1 (4 pp.)

Adequate design with low maintenance cost in the future should be prime objective in construction. Advances in science of various fields associated with civil engineering, particularly soil mechanics and concrete practice, enable departure from traditional practices. Examples of problems peculiar to gas industry and their solutions are cited.

Gas Fire Protection

Control of Natural Gas Fires. A. B. Guise. *Pipe Line Ind. 8,* 54 (1958) Feb. (3 pp.)

Series of tests have determined the effectiveness of dry chemicals in controlling various types of natural gas fires. Relationship between rate of gas flow and rate of dry chemical flow was established. Type of clothing required by fire fighters for various types of fire also was determined.

Training Programs

How to Determine Training Needs. C. M. White. *Petrol. Refiner 37,* 211 (1958) Feb. (4 pp.)

Five steps can be incorporated in training programs to develop potential: adopt goals, take inventory, determine needs, evaluate and review. Then determine the type of training that is needed most.

Commercial Cooking

Keep Your Commercial Customers. J. S. McElwain *A.G.A. Monthly 40,* 29 (1958) Feb. (4 pp.); Six Part Program for Building and Holding Commercial Customers. *Am. Gas J. 185,* 46 (1958) Mar.

Author cautions against the lax attitude industry has taken in providing trained experts to service

commercial cooking establishments, heart of the commercial business of the industry. Outline of six service practices is included.

Chemical Process Patents

Now's the Time to Review Patent Fundamentals. R. G. Crooks. *Chem. Eng. 65,* 121 (1958) Feb. 24 (16 pp.)

Comprehensive report slanted at those whose grasp of patent fundamentals is based on outdated legislation. For example, a recently issued composition-of-matter patent, if upheld, may curtail research, development, design, construction and sales programs of some of the most influential companies in chemical process industries. Engineers and engineering managers are busy reviewing patent fundamentals while attorneys are digging in for a long, hard battle. Article aims for complete, all-in-one-place, up-to-date coverage of a major portion of engineering practice.

Machine Information Search

The Searching Selector of Western Reserve University. *Research & Eng. 4,* 7 (1958) Jan./Feb. (4 pp.)

Appropriate equipment design not only simplifies programming, but actually permits a wide extension in the range of characteristics that may be recorded as reference points for defining scope of a search of literature. In addition, processing of information can be streamlined. Western Reserve University has developed a *Searching Selector* so designed that 10 searches may be interrelated as to scope or completely independent.

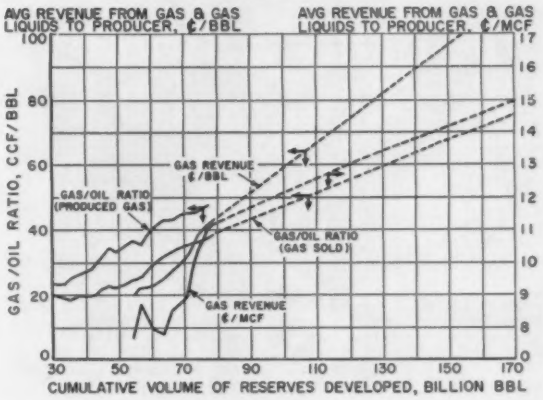
2. ENERGY SUPPLY AND ECONOMICS

U.S. Reserves and Productive Capacity

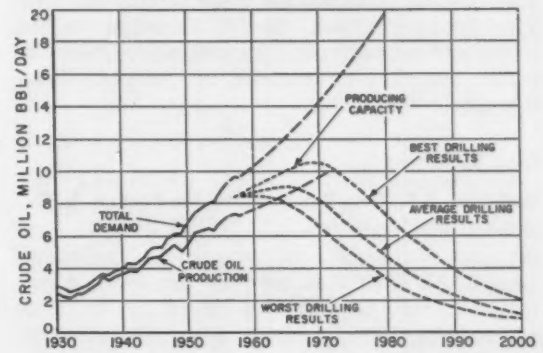
A Study of the Future Productive Capacity and Probable Reserves of the U.S. W. Davis. *Oil Gas J. 56,* (1958) Feb. 24 (15 pp.); **Not Oil's Year.** *Bus. Week No. 1487,* 32 (1958) Mar 1; **A Hard Look at Oil.** *Ibid.,* 128.

Average drilling return in bbl of U.S. petroleum reserves established per total foot drilled has been declining for 20 years. Further decline may be expected. Thus to hold drilling rate as full as possible in order to obtain more complete discovery and production of reserves, drillers' profits must be assured by continual increases in the real price of crude oil. Estimates of future production are given, based on a reserve balance electronically computed from variations in drilling-return extrapolation, crude-oil price, producing capacity as per cent of reserves and U.S. petroleum demand. Peak production of 9 million bbl/day is attained with $4/bbl maximum price in 1967, with a decline thereafter. Natural gas is involved in this estimate both in total drilling footage and in revenue/bbl.

IMPORTANT FACTORS WHICH AFFECT GAS REVENUE PER BARREL OF OIL


AVG REVENUE FROM GAS & GAS LIQUIDS TO PRODUCER, ¢/BBL
AVG REVENUE FROM GAS & GAS LIQUIDS TO PRODUCER, ¢/MCF
GAS/OIL RATIO, CCF/BBL
GAS REVENUE ¢/BBL
GAS/OIL RATIO (PRODUCED GAS)
GAS/OIL RATIO (GAS SOLD)
GAS REVENUE ¢/MCF
CUMULATIVE VOLUME OF RESERVES DEVELOPED, BILLION BBL

FUTURE PICTURE FOR UNITED STATES PRODUCIBILITY AND RESERVES



(Adapted from Davis, W.)

Rig Activity Expected to Gain Momentum in 1958. B. Raimer. *Drilling 19,* 106 (1958) Feb. (2 pp.)

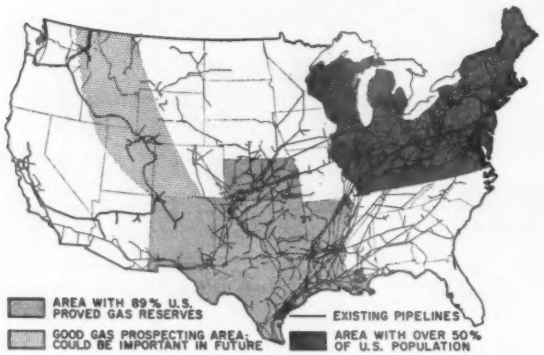
Although 1957 fell short of industry predictions, overall increase in petroleum demand coupled with reduced imports can prove to be impetus for greater U.S. drilling activity in 1958.

Exploration

In Exploration: The Pace Must Be Quickened—Fast! *Petrol. Week 6,* 47 (1958) Mar. 7 (7 pp.)

If oil discovery rate in U. S. and abroad is to increase significantly, radically new exploration techniques will have to be developed. Threat of dwin-

ROOM FOR MORE PIPELINES TO LINK GAS RESERVES, CUSTOMERS


AREA WITH 89% U.S. PROVED GAS RESERVES
GOOD GAS PROSPECTING AREA; COULD BE IMPORTANT IN FUTURE
EXISTING PIPELINES
AREA WITH OVER 50% OF U.S. POPULATION

(*Adapted from* Growth of Natural Gas, *right*)

dling reserves has spurred new efforts on research front among geologists, stratigraphers, geophysicists, seismologists, paleontologists, geochemists and other specialized exploration scientists. Objective: to find, surely and economically, the 450-billion bbl of oil which, according to estimates, are yet to be found throughout the world.

Gas Reserves

Ratio of U.S. Gas Reserves to Production Is Declining. *World Oil 146,* 130 (1958) Feb. 15.

Although a record total increase in reserves of 14,077,124 MMCF is reported for 1956, a new record demand of over 10.9 trillion CF has again reduced the ratio of reserves to annual production.

Dip in Reserves Breaks Long Trend. *Petrol. Week 6,* 11 (1958) Mar. 14 (4 pp.)

Exploratory drilling dropped 9% in 1957 to 14,707 tests, and new crude reserves found per foot drilled hit a new low of 10.7 bbl. This was the first noticeable dip in 24 years. Total reserves of petroleum liquids—crude plus natural gas liquids—declined 349,216,000 bbl to 35,987,765,000 bbl. Natural gas reserves continued upward, but gain was less than in preceding two years. Increase totaled 8.8 trillion CF to a record high of 246.6 trillion CF. Canadian reserves rose with increased drilling.

U. S. Natural Gas Reserves Climb to Record 246 Trillion Cubic Feet. New York: Public Information Bureau Release 15-N8, A.G.A. (1958) Mar. 11.

Proved recoverable natural gas reserves in the U. S. climbed 8.8 trillion CF to an all-time record of more than 246 trillion CF in 1957, according to the A.G.A. This substantial increase was realized even though total net production during 1957 climbed to a peak figure of 11.5 trillion CF, topping the previous record of 10.9 trillion CF reported last year. New discoveries of natural gas liquids also reached an all-time high last year, totaling 128.5 billion barrels. Canadian natural gas reserves, reported by the Canadian Petroleum Association, climbed to 20.7 trillion CF in 1957, compared with 19 trillion at the end of 1956. Net production of 277 billion CF was reported against reserved additions of two trillion CF.

Production

Growth of Natural Gas for the Last 12 Years. *Oil Gas J. 56,* 108 (1958) Mar. 10 (2 pp.)

Two pages of graphs depict rapid growth of natural gas industry since World War II. Drillers have found more gas-gas liquids than crude. Greatest reserves are in the Southwest.

Smaller Increase Forecast for Natural Gas Production. *World Oil 146,* 168 (1958) Feb. 15. (4 pp.)

Temporary business recession will combine with incentive-destroying federal regulations to put brakes on marketed gas production growth in 1958. Tables with breakdown by years on production and consumption are brought up to date.

Oil Demand

Lagging U.S. Demand to Require Less Supply. *World Oil 146,* 94 (1958) Feb. 15 (4 pp.)

Total U.S. demand for all oils in 1957 was 9,367,000 bbl/day, a somewhat disappointing increase of only 1.7% over the previous year. Small increase would not have occurred without the Suez crisis which necessitated emergency exports of crude oil to Europe early in '57. With exports back to normal (345,000 bbl) and domestic demand predicted to increase 221,00 bbl, estimated demand for 1958 will be virtually the same—9,369,000 bbl/day.

Offshore Activities

Today's Offshore Oil Picture: Problems, Progress, Promise. *Petrol Week 6,* 51 (1958) Feb. 21 (15 pp.)

Recapitulation of picture indicates that this year's level of activity will be slower. Major problem: determination of method to cut costs. Federal-state dispute on offshore boundaries also constitutes a continuing plague. Hurricanes last year gave offshore equipment its first major test, and while over-all results were good, damages were high, affecting insurance rates. New types of drilling units and practical methods of well completion under water are near-future fulfillments.

Latin Development

Oil Prospects in Latin America. J. Grindrod. *Petrol. 21,* 83 (1958) Mar. (5 pp.)

South America, particularly Venezuela, Brazil and Argentina, possesses vast potential sources of petroleum. Venezuela has encouraged development of her resources by private capital and free enterprise; the other countries have been slow to allow this and believe that they themselves can achieve ultimate success. In these two and other countries where exploration and exploitation practice is not allowed, openings for outside interests could be created by construction of additional petroleum treatment and transport facilities over the coming years as production expands to meet increasing world demand.

Electronic Energy Devices

New Heat-to-Electricity Converter Has Promising Efficiency. *Ind. Heating 25,* 296 (1958) Feb. (2 pp.)

Thermionic converters may eventually be able to change more than 30% of heat energy directly into electricity. Several known scientific principles are combined in a unique manner. Two electrodes within the tubelike device are maintained at high—but different—temperatures. New approaches to electrode design, materials used and gas environment within the envelope have resulted in a more efficient flow of electrons.

Power Plant Coal

Incremental Costs in the Use of Coal. H. B. Lammers. *Coal-Heat 74,* 29 (1958) Feb. (6 pp.)

Analysis of operation and of maintenance costs of approximately 75 utility companies and 200 generating stations. Comparisons of operating costs for "new" and "old" stations, as well as for "modern" station using coals, are made. Increased economies are possible by 1) using quality coal, 2) increasing station capacity, 3) adding to investment to increase automation and 4) operating at high load factors.

Nuclear Power

Nuclear Power Future. C. G. Manly. *Chem. Eng. 65,* 133 (1958) Mar. 10 (6 pp.)

Encouraging signposts which indicate that economic nuclear power should be here by 1965 are abundant uranium supplies and reductions in reactor operating costs. Chemical engineers should be aware of what future holds for nuclear power for they will play a major role in this field.

New Look at Nuclear Power's Prospects. *Chem. Week. 82,* 63 (1958) Mar. 15 (3 pp.)

Though still in the development stage, U.S. nuclear industry is expected to have more than 500,000 kw of electric power capacity installed by 1960. Recent survey by Atomic Industrial Forum indicates that by 1965 projected programs will present an annual market for $30-140 million worth of fabricated uranium fuel, $120-180 million worth of nuclear equipment.

Nuclear Heat Gasification

AEC's Industrial-Heat Program. J. F. Kaufmann and D. H. Stewart, Jr. *Nucleonics 16,* 65 (1958) Feb.

Work done by the Bureau of Mines on coal gasification has aroused interest in helium as a high-temperature coolant for test reactors. Conventional process produces gas by burning coal at 2500°F with relatively pure oxygen in presence of steam. Cost averages about $1.20/million Btu. Nuclear fuel would cost $0.26/million Btu (based on U^{235} at $17/gm).

Nuclear Industrial Heat

The Outlook for Industrial Heat Reactors. *Nucleonics 16,* 62 (1958) Feb. (3 pp.)

While considerable interest has been stirred, very little actually is being done in industry on the development of heat reactors. Most companies indicate that they stand ready to adapt their existing designs of electricity-producing nuclear plants to heat production when applications warrant it. Although several companies feel that heat reactors would be competitive before electric power reactors, the general feeling is that the cost reduction necessary for heat reactors will come largely as a result of economies achieved on electricity reactors. User industries most likely to use this concept first—paper and pulp and the chemical industries.

Fluid Injection Operations

Economics and Prediction of Oil Recovery by Fluid Injection Operations. W. L. Horner and I. F. Roebuck, Jr. *Producers Monthly 22,* 32 (1958) Feb. (8 pp.)

Fluid injection projects in the U.S. have increased rapidly in recent years. While such operations offer many rewards, when properly evaluated and correctly applied, careful studies of geological engineering and financial aspects are required before the project is initiated. Article gives examples of benefits to be derived and complex processes involving such operations are described. Various approaches to

proper evaluation of fluid injection operations are discussed.

Future Fuels

Fuels Figure in Our Future. Rear Admiral H. G. Rickover. *Ind. Laboratories 9,* 22 (1958) Mar. (4 pp.)

Article stresses importance of training men for careers in engineering and of conducting intensified research in nuclear technology.

3. NATURAL GAS AND PETROLEUM PRODUCTION

Arkansas Exploration

Gas Search Quickens in North Arkansas. N. S. Morrisey. *Oil Gas J. 56,* 112 (1958) Feb. 17 (3 pp.)

Air and gas drilling operations, used in conjunction with new plastics or other cementing material to seal off troublesome water during drilling operations, have permitted operators to step up their search for new gas reserves in northwest Arkansas. Drilling depths are variable, ranging from 1200-9000 ft deep wells.

Canadian Production

Performance of the Leduc D-3 Reservoir. R. Horsfield. *J. Petrol. Tech. 10,* 21 (1958) Feb. (6 pp.)

Discovery of the Leduc D-3 pool in 1947 at a depth of 5300 ft made oil history after more than a decade of fruitless wildcatting in Southern Alberta and Saskatchewan. Relatively thin oil zone covers an area of 21,650 acres and originally contained more than 400 million bbl of oil in place. Article describes history and operation of one of Canada's major oil fields.

Drilling

Comparison: Turbodrill and Conventional Bit. E. L. Lomax. *Oil Gas J. 56,* 133 (1958) Mar. 3 (2 pp.)

Tests recently conducted in Britain indicate that turbodrills average 45-50 ft/hr compared to 24-25 ft by conventional rotary. Turbodrills use more bits per footage drilled. In some instances, more frequent bit changes may actually increase drilling time.

Russian Electric Arc Drill Nears Oil Field Test Stage. A. J. Steiger. *Drilling 19,* 106 (1958) Mar. (2 pp.)

Experiments conducted by the Soviet Academy of Science's Petroleum Institute have shown that a 200 kw high-voltage drilling unit of the tangential type operating at a spark discharge rate of 200/sec can drill a 250 mm well-hole in dolomite at the rate of 10 m/hr, according to reports published in *Neftyanoye Khozyaystvo* (Oil Economy).

Extreme Pressure Lubricant Promises Drilling Cost Cuts. *Drilling 19,* 109 (1958) Mar.

New muds were developed by Gulf Oil Company to increase bit life, reduce rig time, wear on pipe and equipment and rotary power.

In Situ Combustion

Process Variables in In Situ Combustion. W. L. Martin, J. D. Alexander and J. N. Dew. *J. Petrol. Tech. 10,* (AIME Petrol. Trans.) 28 (1958) Feb. (8 pp.)

Results of laboratory investigations conducted with five crude oils, ranging in gravity from 10.9°-34.2°, to evaluate the in situ combustion process as a method of producing crude oil from reservoirs. Air and fuel requirements, rates of advance, combustion temperatures, and coke and fluid distributions are presented. Mechanism of oil recovery by in situ combustion is discussed.

North Dakota Trend

Drilling Enlarges North Dakota Trend. N. S. Morrisey. *Oil Gas J. 56,* 180 (1958) Mar. 10. (2 pp.)

Operators wonder whether rapidly enlarging Burke County trend will develop into another Southeast Saskatchewan. In both areas, pay zone is Mississippian limestone and production is related to stratigraphy rather than to structure. Big question: Will producing areas merge into one huge field?

Offshore Development

Improved Marine Rigs Bare Sea Floor Secrets. R. O. Frederick. *Drilling 19,* 83 (1958) Mar. (14 pp.)

Special report on global marine rig network that probes mineral possibilities underlying the wet three quarters of the earth's 197,000,000 square miles. Great proving ground has been a small portion of the 129,000 acres of continental shelf extending from U. S. shores out into the Gulf of Mexico. In a little more than 10 years the oil industry has invested $2 billion, taking only about ¼ of that amount in income, to establish reserves estimated at between 800 million and one billion barrels of liquid hydrocarbons and between 5 and 12 trillion CF of gas.

Oil Recovery

A Review of Methods Used to Increase Oil Recovery. R. L. Slobod. *Producers Monthly 22,* 24 (1958) Feb. (8 pp.)

Three major methods of oil recovery—addition of surface active agents to water used in flooding an oil sand, combustion drive and miscible phase displacements—are analyzed technically and economically. Latter two methods give increased oil yield, but are still in development stage. Modification of last method, high pressure gas injection, has proved itself to be successful both technically and economically.

The Use of Carbon Dioxide with Water to Increase Oil Recovery. *Producers Monthly 22,* 10 (1958) Feb. (3 pp.)

Review of the experiences of one man in contributing to development of CO_2 as a means of recovering additional oil while water flooding.

Permeability

The Effect of Fluid-Flow Rate and Viscosity on Laboratory Determinations of Oil-Water Relative Permeabilities. C. R. Sandberg, L. S. Gournay and R. F. Sippel. *J. Petrol. Tech. 10,* (AIME Petrol. Trans.) 36 (1958) Feb. (8 pp.)

Dynamic flow technique was applied to a study of effect of fluid-flow rate and fluid viscosity on oil-water relative permeability determinations. Relative permeabilities obtained were found to be solely a function of saturation and independent of flow rate, provided there was no saturation gradient induced in core sample by "boundary effect." Even though equilibrium with respect to flowing conditions was obtained at lower flow rates, where a saturation gradient exists, this equilibrium is of a "contingent" type rather than the "steady-state" equilibrium implicit in the relative permeability concept. Effect of increasing the oil or non-wetting phase viscosity was to decrease the flow rate required for elimination of boundary effect.

Reservoir Engineering

Application of a Resistance Network for Studying Mobility Ratio Effects. M. A. Nobles and H. B. Janzen. *J. Petrol. Tech. 10,* 60 (1958) Feb. (3 pp.)

Although on the resistance network the flood front is wavy, results of mobility studies with the network compare very favorably with potentiometric studies. Slight deviations from the results of potentiometric studies tend to increase as the mobility ratio differs increasingly from one.

Performance of the Pickton Field. H. B. Barton and F. R. Dykes, Jr. *J. Petrol. Tech. 10,* 27 (1958) Feb. (5 pp.)

Pressure maintenance by injection of dry Pickton field gas and extraneous gas from the Yantis field has increased reservoir pressure at Pickton field to 90% of the original pressure, and a satisfactory gas-sweep pattern has been maintained. Current recovery is 35% of oil in place. It is believed that vaporization of reservoir oil by dry gas injection has contributed substantially to total ultimate recovery.

Reservoir Flow

Fluid Flow in Petroleum Reservoirs. II. Predicted Effects of Sand Consolidation. W. Rose. Illinois: Dept. of Registration and Education (1957); Illinois State Geological Survey Circular 242.

Kozeny theory has been applied to treatment of flow through various types of regular packings of spheres in a study to provide an analytic basis for the assumption that a consolidated sand is less permeable than the unconsolidated sand from which it is derived.

Reservoir Rock

Some Tests Related to Resistivity—Water-Saturation Measurements of Appalachian Sandstone Specimens. C. I. Pierce and R. B. Lowe. *U.S. Bur. Mines Rep. Invest. 5389* (1958) Feb.

Results of a laboratory investigation conducted to 1) evaluate an evaporation method of attaining water saturations in sandstone samples when determining resistivity-saturation relationships and 2) compare saturation exponents derived from data obtained, using different methods of achieving water saturations.

Venezuelan Activities

Venezuela—Land of Promise and Problems for Drilling Men. H. L. Franklin and W. D. Miller. *Drilling 19,* 76 (1958) Feb. (4 pp.)

Drilling in Venezuela falls in three main petroliferous basins, each involving some 20 million surface acres, each offering a complex assortment of drilling demands and problems. Most productive is the Maracaibo basin followed by the Orinoco basin. The Apure-Barinas basin has been the scene of serious exploration only in the past decade.

Well Practice

High-Pressure Wellhead Equipment. *Mech. Eng. 80,* 62 (1958) Mar. (7 pp.)

Need for 15,000 psi equipment will increase as

greater depths continue to be encountered in drilling modern oil wells. New flange standards, special closures and improved gaskets resulted from the experimental work of a task group of the Association of Well Head Equipment Manufacturers.

Method and Apparatus for Starting Flow of Wells. C. C. Carlisle. U. S. 2,823,620 (1958) Feb. 18.

For starting flow of liquids from a well under gas pressure, well fluid outlet tubing and annular space between tubing and well casing are both connected to a source of high gas pressure by an oscillating valve. This permits pressure to be applied alternately to the fluid column in the tubing and in the annulus, causing a vertical surge in columns which can be built up to the point where surging down-pressure overcomes hydrostatic head of the rising oil-gas column which then overflows at the well top.

Well Cementing

Properties of Cementing Compositions at Elevated Temperatures and Pressure. G. Carter and D. K. Smith. *J. Petrol. Tech. 10,* (AIME Petrol. Trans.) 20 (1958) Feb. (8 pp.)

Investigations have been conducted on properties of many deep well cementing compositions to determine their strength behavior over curing periods to 180 days at elevated temperatures and at 3000 psi pressure. All compositions except mixtures of pozzolans and hydrated lime show from mild to severe degrees of strength loss over a temperature range from 230°-320°F after setting. Pozzolan-lime compositions actually gain in strength over a period of time at these high temperatures.

Well Testing

Better Fluid Recovery on Drill-Stem Test. E. V. Lancester, H. E. Schwegman and W. H. Wright. *Oil Gas J. 56,* 186 (1958) Mar. 10 (3 pp.)

New tool, acid formation cleaner, and proper selection of chemicals is said to be more accurate in evaluating formations during a drill-stem test because hole damage is reduced and formations are permitted to produce near their maximum output.

4. GAS CONDITIONING AND LPG RECOVERY

Condenser Design

Make a Nomograph to Find Condensate Film Temperature. F. Rodriguez and J. C. Smith. *Chem. Eng. 65,* 150 (1958) Mar. 10 (2 pp.)

Do-it-yourself nomograph permits one batch of cumbersome trial-and-error calculations to be bypassed in giving film temperatures of condensers handling noncondensables.

Dehydration

Economical Operation of Glycol Dehydration Units. W. Richardson. *Pipe Line Ind. 8,* 49 (1958) Feb. (5 pp.)

Various types of glycol dehydration units are available. Type most satisfactory for a particular installation depends on type of production, pressure and locality; equipment costs; value of continuous pipeline operations; final dewpoint expectations and operating costs and maintenance. Four basic systems available are complete wellhead dehydration, centralized field dehydration, mainline plant and a combination of wellhead and mainline plants.

Dust Removal

Dust and Mist Collection—A Critique on the State of the Art. K. E. Lunde and C. E. Lapple. *J. Air Pollution Control Assoc. 7,* 289 (1958) Feb. (8 pp.)

Fifty-year review includes status of theoretical knowledge, measurement techniques, discussions on conditioning, surface retention, deposition mechanisms, deposit removal and current knowledge.

H_2S Removal

Aqueous-Amine Acid-Removal Process Needn't Be Corrosive. J. S. Connors. *Oil Gas J. 56,* 100 (1958) Mar. 3 (6 pp.)

Aqueous-amine process for removing acid from natural gas can be made practical with proper design of an amine treater. With a proper design, carbon-steel equipment can be used and corrosion will be minimized at the same time.

New Lone Star Gas Treating Plant Will Use Hot Potash-Amine Method. *Gas Age 121,* 39 (1958) Feb. 20 (2 pp.)

New method will give lower fuel requirements and reduce maintenance costs in gas sweetening. Also it will permit tapping of sour gas resources considered uneconomical under earlier methods.

Propane Recovery

Low-Cost Alky-System Depropanizer. W. O. Weber. *Oil Gas J. 56,* 139 (1958) Feb. 24 (3 pp.)

Special features of this efficient system are designed to depropanize condensed vent gas from refrigeration compressor condensate accumulators.

Chief advantage: higher propane concentration. Results: low-cost design and operation.

Separators

Slug Catcher. L. Resen. *Oil Gas J. 56,* 148 (1958) Mar. 10 (2 pp.)

Device handles incoming slugs of liquid from offshore line at gas-separation plant. It removes most of the liquid brought in by incoming gas stream.

Sulfur Recovery

The Fulham-Simon-Carves Process for the Recovery of Sulphur from Flue Gases. T. Kennaway. *J. Air Pollution Control Assoc. 7,* 266 (1958) Feb. (9 pp.)

Review of research studies conducted by Simon-Carves, Ltd., to develop a process for manufacturing ammonium sulfate from flue gases. At a pilot plant, constructed for this study, a process consisting essentially of scrubbing the flue gases with ammonia liquor derived from gas works or coke oven plants to produce a solution of ammonium sulfate, sulfite, bisulfite and thiosulfite was developed. This solution, by a process of autoclaving, could then be converted into ammonium sulfate and sulfur. Investigations were initiated in 1938.

Condensate Removal

Cyclic Adsorption Processes for Removal and/or Recovery of Condensable Hydrocarbons from Natural Gas. E. B. Miller (assigned to Jefferson Lake Sulphur Co.) U. S. 2,823,764 (1958) Feb. 18.

Water vapor and condensable hydrocarbons are removed from wet natural gas by a cyclic adsorption process, wherein a rotary multiple-bed adsorber passes the beds successively through the stages of first purge, first activation, second purge, second activation and third purge.

Nitrogen-Methane Fractionation

Separation of Nitrogen from Methane. B. E. Eakin and R. T. Ellington (assigned to Institute of Gas Technology) U. S. 2,823,523 (1958) Feb. 18.

This is a liquefaction-fractionation process for separating nitrogen from methane, the improvement consisting of the use of compressed cooled methane as the primary refrigerant instead of nitrogen. Through heat exchange with the product methane, the refrigerant methane is condensed, thus supplying heat for the distillation column, then expanded to a lower pressure in several stages for cooling the feed gas.

5. NATURAL GAS TRANSMISSION

Compressor Drive

Westcoast's Engine-Driven Centrifugal-Compressor Units Are a "First." R. W. Boebinger. *Oil Gas J. 56,* 160 (1958) Mar. 10 (5 pp.)

These units, on the Westcoast Transmission system, are the first applications for downstream stations on a gas transmission line. Stations feature provisions for automatic devices.

Compressor Stations

How to Reduce Surge and Valve Losses. C. S. Kenworthy. *Oil Gas J. 56,* 170 (1958) Mar. 10 (3 pp.)

Modifications reduce horsepower losses from piping surge and compressor valves, and cut fuel consumption 12%.

$750,000 Saving in Compressor Stations. J. B. Eaton. *Oil Gas J. 56,* 176 (1958) Mar. 10 (2 pp.)

Unitized drive system, consisting of compressor engine flywheel shaft whiich energizes jacket water pumps and d.-c. cooling tower motors, has saved $750,000 for Texas Gas Transmission Corp. on compressor station expansion and building costs since 1952.

Engine Wear

Radioactive Tracers Used to Measure Bearing Wear. M. W. Savage and L. O. Bowman. *Pipe Line Ind. 8,* 36 (1958) Feb. (5 pp.)

Tests conducted on irradiated bearings have shown that relative connecting rod bearing wear at different operating conditions can be predicted by using the load carrying capacity concept. Use of "tagged" bearings aids in study of bearing lubrication. Designers can predict effect of changes in bearing design and lubricating oil properties on normal rubbing wear.

Measurement

Calculating Measurement Charts. W. E. McDowell. *A.G.A. Monthly 40,* 31 (1958) Feb. (8 pp.)

Basic principles of types of equipment used in machine calculation at El Paso Natural Gas Co. are outlined. Punch-card accounting machines and methods have been applied to the operations since July 1955. Article describes steps necessary, including inter-departmental relations and controls, to make operation efficient.

Metering

Measuring Accuracy Is Improved By Two Meter-Proving Methods: Gravimetric, Volumetric. M. L. Barrett, Jr. *Oil Gas J. 56,* 153 (1958) Feb. 24 (3 pp.)

Basic principle of determination of meter performance is that meter must be proved under conditions which are identical to those under which it is normally expected to operate. Gravimetric method is most useful when applied to permanent installations; volumetric method is most favored in all branches of petroleum industry. Portable open-type volumetric provers are in common usage.

Pulsations and Gas Measurement. H. S. Bean. *Pine Line Ind. 8,* 41 (1958) Feb. (4 pp.)

Proper design of meter runs is necessary for minimization of pulsation effects in gas pressure. These pulsations can cause an error in meter reading. The A.G.A. is sponsoring research to study effect of gas pressure pulsations.

Pipelines

Natural-Gas Pipelining. *Oil Gas J. 56,* 115 (1958) Mar. 10 (10 pp.)

Questions and answers designed to bring reader up to date on technology of natural gas pipelining. Refresher article is based on technical developments, methods and procedures reported in *Journal* articles in 1957.

Public Relations

Aspects of Public Relations in Acquiring Rights-of-Way. O. R. Bates. *Pipe Line News 30,* 52 (1958) Feb. (2 pp.)

Pointers on how to create good will and confidence include knowledge by landowner that company doing the acquiring is sound and is working in public interest. Respect for landowner's property and informing him of why certain steps are being taken creates trust. Fulfillment of special promises on commitments to landowner, prompt and proper cleanup, and settlement immediately following construction also are important practices.

Telemetering

Gas Load Control Through Telemetering. R. D. Hays. *Pipe Line News 30,* 46 (1958) Feb. (7 pp.)

Illinois Power Co. purchases natural gas from four pipeline suppliers for about 175,000 customers including 83,000 space heating, located in about 60 communities in central Illinois. Communities range in population from 300-85,000 and the service area extends from Kewannee and LaSalle in the northern part of the state to Central and Mt. Vernon 200 miles to the south; and from Danville in eastern Illinois to Jacksonville, 160 miles to the west. Four pipeline companies deliver gas to Illinois Power through 21 town border stations. These stations contain 33 orifice meter runs and three positive displacement meters. Telemeter equipment has been connected to 29 of the office meters in 17 of these stations. Telemeters will be installed in other stations when load growth justifies these connections.

Welding Practice

New Joint Design Is Needed in Pipeline Welding. L. J. Cunningham. *Oil Gas J. 56,* 144 (1958) Mar. 10 (3 pp.)

Northern Natural Gas Co. has achieved good results in its experiments with a 20° bevel in pipeline welding. Next step may be a combination 30°-11° bevel.

Westcoast Pipeline

The Story of Westcoast—Canada's First Major Gas Line. *Pipe Line News 30,* 24 (1958) Feb. (15 pp.)

Summary of exploration, incorporation, construction, physical facilities, equipment, operation and housing program of the Westcoast system which extends 560 miles from Taylor, B.C., to Sumas on the International Border.

6. GAS AND LPG STORAGE

Gas Holders

The Construction of a Welded Gasholder and Tank at Borehamwood. R. F. Robinson and W. Simpson. *Gas J. 293,* 291 (1958) Feb. 5 (5 pp.); *Gas World 147,* 344 (1958) Feb. 15 (4 pp.)

Study and careful specification of welds and of X-ray inspection methods are reported, as well as plumbness and levelling of structure.

Repairs to a 100,000 cu. ft. Holder at Keith. J. E. Scott. *Gas J. 293,* 395 (1958) Feb. 19 (3 pp.)

Repairs on a 33-yr old holder with leaky inlets and outlets are described.

Liquefied Methane

Cost Factors Involved in the Use of Methane to Replace Coal Gas. J. G. King. *Gas Times 42,* 39 (1958) Feb. (2 pp.)

Summary of work done in U.S.A. on the economics

of using liquefied natural gas to replace or to supplement town gas produced in conventional way.

Natural Gas to Come by Sea from Gulf Coast to Canvey Island. *Gas Times 42,* 32 (1958) Feb.; Importation of Liquid Natural Gas. *Gas World 147,* 291 (1958) Feb. 8; An Ocean Ferry for Natural Gas. *Business Week 1490,* (1958) Mar. 22 (2 pp.)

Gas Council (Great Britain) and the Constock Liquid Methane Corp. of America jointly own a cargo ship which, after conversion, will transport about 2000 tons of liquefied natural gas. According to contractual agreement between the two groups, the first shipment should arrive in the Thames about next February. If this experiment in shipping liquid methane proves successful, it is hoped that the British government will sanction importation of liquefied natural gas in bulk. Results of success for Constock will be reflected in direct or indirect (through affliated companies) sales of large volumes of natural gas in liquid form in many industrial areas of the world where there is a growing shortage of reasonably priced fuels.

7. MANUFACTURED GAS AND CHEMICAL PROCESSING

Acetylene

Bulls and Bears on Acetylene. *Chem. Eng. News 36,* 112 (1958) Mar. 3 (5 pp.)

Conservative projections for 1961 indicate that acetylene production will climb to 750 million lb/yr; optimistic forecasts almost double this figure. During 1957, calcium carbide was the source for approximately 80% of acetylene produced, with natural gas a poor second. Sale of byproduct synthesis gas and nitrogen to associated methanol and ammonia operations is necessary to improve return on plant investment for natural gas acetylene. Since ethylene is a strong competitive raw material with acetylene for manufacture of certain products further economic and process factors enter the picture. However, several processes are in pilot plant stages of development, and a 12% per year rate of increase is predicted.

Alberta Petrochemicals

Petrochemicals — Alberta or the East? *Chem. Processing 42,* 23 (1958) Feb. (9 pp.)

In Alberta, existing production is impressive, raw materials are abundant, all fuel reserves are immense and power rates are low; Ontario and Quebec claim proximity to markets, less rigorous climate and available refinery off-gases. General growth of Western Canadian economy and increase in trade with the Orient may convince chemical manufacturers that a shift to Alberta is warranted.

Alcohols

First U.S. Inventa Methanol Plant Fills Open Slot at Integrated Chemical Complex. C. S. Cronan. *Chem. Eng. 65,* 62 (1958) Feb. 24 (3 pp.)

New methanol plant completes integration of processes to convert natural gas to pentaerythritol. It takes its synthesis gas feed from natural gas, steam-reforming furnaces, previously in place, which also supply the ammonia facility. Methanol product feeds new formaldehyde installation. (At a later date, some of this methanol may be diverted to market.) Formaldehyde, in turn, serves as feed for manufacturing pentaerythritol in a plant on-stream since March 1957.

Ammonia

Chemical Firm Pioneers Ammonia Process in U.S. *Ind. Sci. and Eng. 5,* 17 (1958) Feb. (3 pp.)

Birmingham, Ala., is the site of first plant in U.S. to produce anhydrous ammonia exclusively from coke oven gas. It also is a pioneer in low temperature technology in chemical processing. As a raw material for ammonia manufacture, coke oven gas offers 55% free hydrogen but has a complex mixture of light hydrocarbons plus some sulfur and oxygen compounds. Impurities of separation process are recovered as methane, ethane-ethylene and benzene.

Aromatics

Aromatics from Petroleum. H. G. McGrath. *Petrol. 21,* 95 (1958) Mar. (2 pp.)

Aromatics are now synthesized from petroleum on a large scale, the principal process employing a platinum catalyst. Consideration is given to future likelihood of synthesizing benzene and toluene from *n*-hexane and *n*-heptane and resulting modifications of molybdena-alumina or chromia-alumina catalysts which would be necessary.

Solvent Extraction of Aromatic Hydrocarbons. M. Rifai. **Part 1. Liquid-Liquid Equilibria for the Ternary System Triethylene Glycol-*n*-Heptane-Aromatics.** *Rivista dei Combustibili 11,* 811 (1957) Dec. (18 pp.); **Part 2. Liquid-Liquid Equilibria for Ternary System Dipropylene Glycol-*n*-Heptane-Aromatics.** *Ibid.,* 829 (12 pp.)

In Part 1, use of triethylene glycol was studied as a solvent of the aromatic hydrocarbons from C_6-C_8

blended with *n*-heptane. Three ternary systems were studied: triethylene glycol-benzene-*n*-heptane, triethylene glycol-toluene-*n*-heptane, and triethylene glycol-ethylbenzene-*n*-heptane. Data obtained were correlated both by means of Othmer and Tobias' coordinates as well as those of Bachmann corrected by Brown. In Part 2, equilibrium data at 25° C of the binodal curves and lines of conjugation for the dipropylene glycol-benzene-heptane and the dipropylene glycol-ethylbenzene-heptane systems are submitted. Plat points have been worked out plotting equilibrium data on the coordinates according to Hand. Object is to study properties of dipropylene glycol as a selective solvent of aromatic hydrocarbons from their blends with paraffin hydrocarbons and to obtain further data on the ternary equilibrium in the liquid phase.

Benzene Forerunnings

Defronting and Rectification of Crude Benzole. O. Clyne and T. Scott. *Gas World 147,* (Coking Supplement) 53 (1958) Mar. 1 (14 pp.)

Operating results and cost data for the Holmes/Taylor system of removal of forerunnings from crude benzene are given in detail. Results of a laboratory study of effects of added cyclopentadiene on acid-wash removal of thiophene from benzene are discussed. Review of the chemistry and polymerization of cyclopentadiene is appended.

Benzene Refining

Hydrofining of Benzole with Reference to British N.B.A. Standard Specifications. K. W. Bochmann and R. J. Venn. *Gas World 147,* (Coking Section) 31 (1958) Feb 1 (5 pp.)

Hydro-refining process will be more universally adopted in the future for purifying benzole, in place of the acid washing process, because of increased yields which result. Article presents outline for efficient operation of the process.

Udex Extraction of Coke Oven Benzole. R. M. Deanesly and V. E. Henny. *Gas World 147,* (Cooking Section) 27 (1958) Feb. 1 (3 pp.)

Udex process, method of extracting liquids by use of glycols blended with controlled amounts of water as a selective solvent for aromatics, was initially developed and engineered for the extraction of aromatics from products resulting from the processing of petroleum naphthas over reforming catalysts. Description of process is detailed.

Carbonization

Laboratory Carbonization Assay of Low-Rank Coals at Low, Medium, and High Temperatures. J. B. Goodman, M. Gomez and V. F. Parry. Bureau of Mines Report of Investigations 5383. Washington, D.C.: U.S. Dept. of the Interior (1958) Jan.

Apparatus described in previous publications on this topic has been modified to extend testing range above 500°C without impairing accuracy and reproducibility obtained in low-temperature range. Results presented include product yields from a typical Texas lignite and Wyoming subbituminous-B-rank coal over the temperature range 150°-1000°C. Experimental results show that lower yields of volatile products are obtained from plant-dried lignite than from its raw counterpart. For both the raw- and plant-dried subbituminous-B-coal forms, virtually identical volatile product yields are obtained. Results indicate that the raw lignite is thermally less stable than the subbituminous-B-coal.

Coal Cleaning

Convertol Process. A. H. Brisse and W. L. McMorris, Jr. *Mining Eng. 10,* 258 (1958) Feb. (4 pp.)

Droplets of dispersed oil are brought into intimate contact with solids suspended in coal slurry to be treated in what is known as the Convertol process. Contact causes oil to displace water on coal's surface by preferential wetting, after which coal particles are allowed to agglomerate in a manner permitting their removal from the slurry by centrifugal filtration. Oil treatment is preferred because more than 95% of oil used reports with clean coal recovered. Convertol process has been found extremely effective for removing usable coal from high ash slurries.

Coal Gas Condensers

Some Difficulties Experienced with the Condensers on an I.V.C. Plant. O. H. Barnes. *Gas J. 293,* 389 (1958) Feb. 19 (5 pp.)

Brief history of I.V.C. plant provides an account of difficulties experienced in operating a unit which, in practice, failed to meet its specified duty requirements.

Coal Gasification

The Complete Gasification of Coal. F. C. Wood. *Gas J. 293,* 342 (1958) Feb. 12 (6 pp.)

Total gasification of coal, when compared with manufacture of gas by more widely established car-

bonizing processes, offers several unique features: 1) Gas production is completely separate from coke production, 2) gasification of types and sizes of coal which are unsuitable for carbonization can be undertaken, and 3) gas manufacture costs are reduced because total gasification processes are inherently capable of being operated at high thermal efficiency, often in large units of plant.

Coal Gas Production

The Fuel Expenditure Index. B. H. Cunningworth. *Gas. J. 293,* 278 (1958) Feb. 5 (5 pp.)

Under normal conditions, the fuel expenditure index (F.E.I.) is the difference between the potential therms in coal and saleable therms produced in the form of gas, coke, tar and benzole expressed as a percentage of the coal therms. The F.E.I. is not to be confused with heating value of coke used in producers for retort heating. Potential therms in coal lost in such ways as hydrogen sulfide and ammonia removed during purification, carbon discarded as scale, crude gas leaks through retort walls, and coke on fire during discharge are of minor importance.

Coal Hydrogenation

New Gas Production Method. *The Gas World 147,* 421 (1958) Mar. 1 (2 pp.)

A main objective of constructing a £2-million plant near Manchester is to hasten full-scale development of a new process to produce gas by hydrogenation of coal. Advantages of the new method are expected to be cheapness, flexibility in raw materials, low toxicity of gas, freedom from sulfur compounds and availability at high pressure. High pressure will enable gas to be transmitted economically over long distances without compression so that production plants can be sited where raw materials are cheapest.

Coke Industry, 1957

Preliminary Statistics of the Coke Industry in 1957. M. M. Otero, E. E. Ryan and J. A. DeCarlo. Washington, D. C.: U. S. Bureau of Mines. Mineral Industry Surveys. Monthly Coke Report No. MCR 359. (1958) Feb. 7.

Coke output for 1957, 75,772,353 net tons, was 2% higher than in 1956 and was exceeded only in 1951 and 1953. Although the combined output of coke from slot-type and beehive ovens failed to reach a new peak in 1957, the output from slot-type ovens set a new record, 73,754,114 net tons, surpassing the previous maximum of 1955 by 169,000 tons. A slackening in pig-iron production in the last half of 1957 had an adverse affect on coke-oven operations and the operating rate of slot-type ovens dropped from 95.3% in January to 74% in December. Beehive oven operations were affected to a greater extent and production in December was only about one-third that produced in January.

CO-Olefin Reaction

Catalytic Hydrocondensation of Carbon Monoxide with Olefins. Part 18. Hydrocondensation of Carbon Monoxide with Pentene-1 and the Isomerization of the Latter to Pentene-2 under the Conditions of this Reaction. Ya. T. Eidus and M. B. Ordyan. *Izves. Akad. Nauk S.S.S.R. Otdel. Khim. Nauk No. 11,* 1408 (1957) Nov. (3 pp.)

Reactions of CO and pentene-1 studied at 190°C in the presence of H_2.

Ethylene Sulfide

Cyclic Sulfides. I. Ultraviolet Spectra of Ethylene Sulfides. R. E. Davis. *J. Organic Chem. 23,* 216 (1958) Feb. (3 pp.)

Ultraviolet spectra of several ethylene sulfides have been measured in solution and in gas phase. Spectra have been compared with those of corresponding oxygen compounds. Several possible explanations of the origin of the adsorption are discussed.

Gilsonite Products

New Gilsonite Refinery. *Gas World 147,* (1958) Feb. 8 (4 pp.)

New plant in Colorado manufactures conventional petroleum products from non-petroleum sources. One of the larger delayed coking units in the USA, the plant manufactures 275 tons a day of a coke of exceptional chemical purity, with high octane petrol as an important byproduct. The 1300 barrels of petrol produced daily are being sold locally.

LPG Uses

Where Next for Natural Gas Liquids? *Petrol. Week 6,* 38 (1958) Mar. 14 (2 pp.)

Growing volume of natural gas liquids will enter petrochemical markets and new techniques for recovery and the fractionation may be required to provide raw materials. Predictions are that natural gasoline may eventually become major raw material.

Petrochemicals

In California: Petrochemical Boom? I. Bergsteinson and M. J. Laituri. *Petrol. Refiner 37,* 119 (1958) Feb. (4 pp.)

Enumeration of important building blocks produced from California petrochemical resources with listing of initial or primary products derived. No attempt is made to follow through with final products or consumer items.

Where Are Petrochemicals Headed? W. E. Kuhn. *Oil Gas J. 56,* 95 (1958) Mar. 3 (5 pp.)

In 1930, 0.14 billion pounds of petrochemicals were produced, which accounted for 1% of total chemicals manufactured; in 1957 estimates placed petrochemical production at 38 billion pounds, or 26% of total; forecasts for 1965 indicate that 85 billion pounds of petrochemicals will be manufactured, 40% of total chemicals production. If forecast is accurate, petrochemical production is scheduled to increase more than 100% between now and 1965. About 50% of the raw materials come from refinery operations and the rest come from natural gas and LPG. Supplies from these sources should be adequate during this period. Costs of raw materials will increase due to increased costs of exploration and production and due to spot shortages created by competition for supplies of certain hydrocarbons. In the final analysis, petroleum cost will tend to stabilize at a value which will be close to that of the cost of producing a comparable fuel from shale oil.

Plant Wastes

Some Thoughts on Treatment of Effluents from Carbonising Plants. *Gas World 147,* 258 (1958) Feb. 1 (5 pp.)

Present day solution to the problem of treating effluents from carbonizing plants seems to be discharging them into sewers. However, the tendency to concentrate gas production at fewer and larger undertakings makes disposal of effluents through a sewage system impossible. In addition, conditions regulating effluent discharge have become more stringent in recent years. While a universal solution does not exist, article presents some suggestions which may be applicable to several problems.

Submerged Combustion Prevents Polymer-Waste Problem. G. Weyermuller and J. A. Davison. *Chem. Processing 21,* 44 (1958) Feb. (3 pp.)

When U.S. Rubber planned its new research center, it was expected that polymer waste, estimated to attain a maximum of 1400 gal/day, might cause air or stream pollution problem. Solution to the problem, proved by tests, consisted of evaporating most of the water and volatile components from the polymer waste by submerged combustion and carting the sludge away.

Producer Gas

Calculating Producer Coke Consumption from Producer and Waste Gas Analyses. G. R. Scholes. *Gas J. 293,* 339 (1958) Feb. 12 (3 pp.)

Composition of producer and waste gases serves as a basis for calculating amount of coke used in a producer, which also serves as a check on the tightness of retorts.

Propylene

Propylene Cracks the Polymer Market. J. W. Bradley, R. L. James and R. E. Messing. *Chem. Eng. 65,* 88 (1958) Feb. 24 (4 pp.)

Brilliant work on "directed" polymerization of olefins by Natta, Ziegler, Phillips and others has made possible the building of propylene macromolecules. Now, precise orientation of monomers, under influence of complex organometallic catalyst systems, yields a solid polymer.

Pyrolysis

Pyrolysis of Aromatics and Related Heterocyclics. J. J. Madison and R. M. Roberts. *Ind. Eng. Chem. 50,* 237 (1958) Feb. (14 pp.)

Liquid phase pyrolysis at 425°-500°C of 43 aromatics and heterocyclics was studied to find features of molecular structure responsible for formation of products of higher molecular weight. Unsubstituted aromatics having the anthracene configuration as part of their structure and aromatics with one or more methylene groups bridging two aromatic nuclei tend to form heavy residue. Condensation of an alkyl aromatic is more rapid than that of the corresponding parent compound and is affected by the number, structure and position of the substituents.

Radioisotope Methods

Radioisotopes in Petroleum Refining. W. H. King, Jr. *Ind. Eng. Chem. 50,* 201 (1958) Feb. (4 pp.)

One oil company estimates savings of $1,500,000 in one year from the use of radioisotopes to improve testing methods for measuring and maintaining the performance of refining equipment. Only small quantities of radioisotopes need be incorporated in process being traced. Convenient and economical, they are very easily detected.

Total-Count Technique in the Refinery. D. E. Hull. *Ind. Eng. Chem. 50,* 199 (1958) Feb. (2 pp.)

New principle in flow measurement is based on the total number of counts registered when a

measured quantity of a radioisotope flows down the stream past a counter. Technique is simple, isotope concentrations are safe and equipment is readily portable.

Segas Plant

Isle of Grain. *Gas J. 293,* 383 (1958) Feb. 19 (3 pp.); Gas from Oil. *Gas World 147,* 385 (1958) Feb. 22 (3 pp.)

Gas-making units at latest Segas installation will comprise four streams of the plant, each having a capacity of 4 million CF/day, using heavy fuel oil as feedstock, rising to 5 million CF/day on light distillate. Three-vessel design consists of steam preheater with vaporizing chamber, catalyst vessel and air preheater. Gas will be pumped at a constant rate through some 11 miles of 30-in. steel main.

Shale Oil

Hydrogenation of Spanish Shale Oil in the Puertollano Plant of the Empresa Nacional Calvo Sotelo. O. von Reitz and H. Kohrt. *Erdöl u. Kohle 11,* 18 (1958) Jan. (5 pp.)

Coal and shale are mined concurrently from the same basin at Puertollano, Cuidad Real Province, as raw materials for an integrated power-oil-chemical installation. The coal fuels a 50,000-kw power plant and also is used in O_2-blast Winkler pressure generators for hydrogen production. Shale is distilled in a Pumpherston-Broxburn retort system and raw oil is hydrogenated (at 325 atm and 350°-400°C) to yield stock for the refinery. Gasoline, medium fuel oils, lube oils and paraffin wax are primary products.

Steam Costs

How to Allocate Process Steam Costs. S. Katell and T. J. Joyce. *Chem. Eng. 65,* 152 (1958) Mar. 10 (3 pp.)

Simplified techniques now refine the accuracy of pricing process steam. Methods proposed permit comparison of unit costs of steam from boilers, exhaust or extracted steam and waste-heat boilers.

Tokyo Gasworks

Toyosu Gasworks. *Coke and Gas 20,* 50 (1958) Feb. (7 pp.)

Toyosu works of the Tokyo Gas Company has a capacity of 63.5 million CF a day; it is expected that ultimately the gas production capacity will reach 212 million CF. Largest gasworks in Japan, this plant is equipped with modern facilities such as complete gasification plant of the Gaz Integrale system, high-pressure gas purification plant, high-pressure spherical gasholders, etc.

Acetylene

Acetylene Separation. F. Maslan (assigned to Escambia Chemical Corp.) U. S. 2,823,763 (1958) Feb. 18.

Process for separation of acetylene from a dilute stream consists of contact with a water slurry of activated carbon and then recovery of acetylene from the carbon.

Process for the Pyrolysis of Hydrocarbons to Acetylene. F. F. A. Braconier and A. H. A. Delsemme (assigned to Societe Belge de l'Azote et des Produits Chimiques du Marly) U. S. 2,822,411 (1958) Feb. 4.

Invention claims a process for producing acetylene, by pyrolysis of hydrocarbons, without employing excessively high temperatures and it further claims provision of apparatus for efficiently pyrolyzing coke oven gas and other hydrocarbons to form unsaturated hydrocarbons. Process comprises a flame in an open combustion zone of increasing cross section in flow direction of flame gases, radially injecting a plurality of streams of hydrocarbons into hot gases from the flame at a second zone wherein combustion is substantially complete.

Process for Utilizing Mixtures of Ethylene and Acetylene without Separation Thereof. B. H. Wojcik and R. M. Thomas (assigned to Olin Mathieson Chemical Corp.) U. S. 2,822,410 (1958) Feb. 4.

Mixture of acetylene and ethylene is continuously circulated in a closed cycle through an acetylene conversion zone and through an ethylene conversion zone. A fresh feed mixture of acetylene and ethylene is added as makeup to the gas stream recirculating to the first conversion zone. Mixture is reacted in each conversion zone with reactant and under conditions for selective but partial conversion of acetylene and ethylene in the presence of each other. Acetylene and ethylene reaction products are separated before circulation of residual gas stream to next conversion zone.

Carbon Black

Process of Separating Carbon Black from Gases. K. Haberl, W. Jahnentz and R. Hilgert (assigned to Chemische Werke Huls A.G.) U.S. 2,822,062 (1958) Feb. 4.

Method of separating carbon black from gases involves removal of bulk of carbon black by means of cyclone separators, cooling hot gases with sprayed water to a temperature above dewpoint of poly-

merizable unsaturated hydrocarbons in the gases, contacting cooled gases in at least one scrubber with a continuously recycled sprayed wash oil, passing the sprayed wash oil through a packed washing tower for treatment and then removing a portion of the oil and replacing it with fresh wash oil, cooling the resulting gases for recovery of wash oil.

Carbonization Process

Method and Apparatus for the Low Temperature Treatment of Materials Containing Carbonaceous Constituents. H. G. Tufty (assigned to Wood Associates, Inc.) U. S. 2,824,827 (1958) Feb. 25.

Devolatilization of coals at low temperatures is achieved by supporting lump charge on a plurality of trays, lowered by cables into a vertical open-ended retort, sealing both ends, heating directly with superheated steam, recovering heat by advance of heating gases through a series of such retorts, and recovering volatiles by condenser cooling of said gases.

Char Desulfurization

Desulfurization of Carbonaceous Solid Fuels. E. Gorin, G. P. Curran and J. D. Batchelor (assigned to Pittsburgh Consolidation Coal Co.) U.S. 2,824,047 (1958) Feb. 18.

Pelletized H_2S acceptor, of about ¼-in. diam, which may be CaO, MnO, Ni, Cu impregnated on an attrition-resistant inert base, is mixed with high-sulfur carbonaceous solids (chars) in finely divided (—14 mesh) form and heated to 1300°F in recirculating stream of hydrogen, which desulfurizes the carbon by transferring it to the acceptor to form sulfides of the latter. Upon separating char by screening, the acceptor may be regenerated with air at 1800°F and recycled.

Gas Purification

Adsorption of Gases with a Liquid-Adsorbent Slurry. F. Maslan (assigned to Escambia Chemical Corp.) U. S. 2,823,765 (1958) Feb. 18.

Process for separating, recovering or purifying gaseous mixtures containing a gas which can be adsorbed on an adsorbent by contacting the mixture with an adsorbent suspended in liquid, the adsorbent and liquid being mutually incompatible. Liquid may be water and adsorbent charcoal, preferably activated, or a liquid-adsorbent slurry can be used for separation of gases soluble in liquid.

Olefin Production

Preparation of Olefins. A. I. M. Keulemans and A. Kwantes (assigned to Shell Development Co.) U. S. 2,824,148 (1958) Feb. 18.

Rapid heating which promotes formation of olefins of heavy hydrocarbon (low aromatic) stocks is achieved by rapid contact with minimum air in a bed of oxidation-promoting solids (V_2O_5), after which the mixture is held for required interval in a larger vapor-cracking zone, then rapidly quenched to produce improved yields of olefins.

Ore Reduction

Method of Reducing Metal Oxides. H. V. Rees and F. B. Sellers (assigned to Texaco Development Corp.) U. S. 2,824,792 (1958) Feb. 25.

Powdered metal oxides charged as a slurry with oil and water react with injected hydrocarbon oils in a 200 psi, 2800°F reactor to yield molten reduced iron as well as a synthesis gas. (CO and H_2).

Oxygen Fractionation

Production of Gaseous Oxygen under Pressure. M. Grenier (assigned to L'Air Liquide.) U. S. 2,822,675 (1958) Feb. 11.

Gaseous oxygen under pressure is produced by evaporative heat exchange. Incoming air is cooled for liquefaction by dividing it into four parts and cooling each part successively with liquid nitrogen, and evaporating oxygen.

Producer Gas Apparatus

Method and Apparatus for Making Producer Gas. K. Bleyer. U.S. 2,821,464 (1958) Jan. 28.

Gasification process and generator comprise superimposed zones for distillation, decomposition and combustion, successively, of downflowing solid fuel. First two zones are heated indirectly by vertical flues through the fuel charge which carries combustion gases rising from lower combustion zone.

Synthesis Gas

Process for the Preparation of Carbon Monoxide and Hydrogen from Heavy Oils. P. W. Garbo (assigned to Hydrocarbon Research, Inc.) U.S. 2,821,465 (1958) Jan. 28.

Synthesis gas is derived from heavy oils by first reacting the oils with steam and oxygen at 1500°-2000°F in a dense phase fluidized bed. The resulting gases with oxygen then flow through a reforming zone comprised of multiple tubes passing through the fluidized bed.

8. GAS DISTRIBUTION

Corrosion Measurement

Electronic Pipe Finder Is Valuable Tool in Making Corrosion Control Investigations. G. M. MacLeod. *Am. Gas J. 185,* 27 (1958) Mar. (2 pp.)

Conductive method is best for corrosion detection because field producing currents supplied by device's transmitter follow paths through buried lines identical to those followed by corrosion causing d.-c. currents. Method is useful for locating buried pipe, continuity checks, locating insulating couplings and soil conductivity checks.

Pressure Governors

Safety Governors and Low Pressure Alarm Systems. J. A. Whitworth. *Gas J. 293,* 288 (1958) Feb. 5 (3 pp.)

Valves with interlocking devices can provide some degree of safety in case of a failure in gas supply, but to cover all danger points and to insure a continuity of supply, it is considered advisable and economical to install a safety governor, incorporating an effective alarm system. For example, inlet of safety governor can be connected to station governor outlet. Connections so arranged can bypass many potential danger points which could cause an interruption in normal gas flow through holders and the station governor system.

Quebec Conversion

Quebec Natural Gas Conversion Program Gets Underway. *Can. Gas J. 51,* 10 (1958) Feb. (2 pp.); **Pre-Dawn Flaring Ceremony Marks Start of Conversion in Montreal.** *Gas Age 121,* 13 (1958) Feb. 20 (2 pp.)

About 250,000 customers in Montreal and $6 million are involved in Canada's largest conversion project. Tie-in between Trans-Canada Pipe Line and Quebec Natural Gas Corporation was made at western end of Montreal Island. Meter and regulating stations are located there. Gas flows through Quebec's 34-mile 20-in. and 16-in. pipeline distribution header across Montreal Island.

Work Load

Work Load Forecasting. A. Tarapchak. *Am. Gas J. 185,* 29 (1958) Mar. (5 pp.)

Thorough examination of one company's operations with objective of controlling work load and balancing it with manpower available. Objective can be attained with forecasting. Methods for making forecast are disclosed.

Odorization

Warning Agent and Process for the Odorization of a Hydrocarbon Fuel Gas Therewith. J. S. McClure (assigned to California Research Corp.) U. S. 2,823,104 (1958) Feb. 11.

This warning agent for odorizing gaseous fuels comprises a mixture of diethyl sulfide and an ethyl propyl sulfide, one of which may be 10-90% of the mixture, the effective amount of agent being 0.5-2.0 lb/MMCF.

9. GAS FUEL UTILIZATION AND APPLIANCES

Air Conditioning

Activated Charcoal for Air Purification. H. L. Barnebey. *Heating, Piping & Air Conditioning 30,* 153 (1958) Mar. (8 pp.)

Activated charcoal removes gases and vapors from air by adsorption. When used with heating, cooling, dust filtration and humidity control, it permits complete conditioning of air. Methods are presented for determining load of contaminants to be removed and for selection and sizing of suitable equipment. Quantity of activated charcoal required to purify air can be predicted from odor removal requirements, independent of amount of air circulated.

A Simplified Method of Preparing Solutions of Glycerol and Water for Humidity Control. J. V. Braun and J. D. Braun. *Corrosion 14,* 117t (1958) Mar. (2 pp.)

Advantages of glycerol-water solutions when compared with other solutions commonly used for humidity control are discussed. Solutions of glycerol and water were prepared in various concentrations and their specific gravities determined. Percent relative humidity over each solution was measured and plotted against specific gravity of solution. Resulting smooth curve can be used in preparing humidity control solutions accurate to within one unit of percent relative humidity.

Commercial Gas Air Conditioning. H. J. Miller and C. Abell. *Butane-Propane News 20,* 23 (1958) Mar. (5 pp.)

Potential market for commercial air conditioning is almost unlimited. Restaurants, including hamburger stands, motels, resorts and summer hotels, and even

country churches would be susceptible to concentrated promotional efforts. Examples of how the St. Petersburg Gas Appliance Co. is doing it are included.

Air Pollution

A Review and Appraisal of Air Pollution Legislation in the United States. S. M. Rogers. *J. Air Pollution Control Assoc. 7,* 308 (1958) Feb. (8 pp.)

Need for determination of basic criteria of air cleanliness, based on scientific data, dictates that most air pollution legislation be such as to provide interim control measures. Review of types of legislation that can be enacted, including administrative officers and offices needed for its enforcement, is presented.

An Evaluation of Environmental Odors. W. F. Kerka and E. R. Kaiser. *J. Air Pollution Control Assoc. 7,* 297 (1958) Feb. (5 pp.)

Odorants and contaminants most frequently reported by city bureaus have been divided into eleven categories. Methods for control of these odors, and the advantages and disadvantages in each instance, are included. Function of air conditioning systems in odor control is presented.

New Finishing Plant Has Heat Recovery Unit. *Ind. Finishing 10,* 30 (1958) Feb. (2 pp.)

First combined paint stoving and Spra-Bonderising plant in Britain to incorporate an Oxycat air treatment and heat recovery unit has been designed and installed. Successful operation over several months has reduced fuel consumption and reduced costs.

Refiners Spending Millions in Fight Against Air Pollution. *Oil Gas J. 56,* 87 (1958) Feb. 17 (16 pp.)

Comprehensive report on how refiners are attacking the problem of controlling their wastes and what it is costing them. Survey covered 40 companies and replies represent 77% of the nation's refining capacity. Study is divided into four parts: 1) cost of pollution control, with expenditures broken down on area basis and based on class of pollutants, 2) organization for control, pointing up the importance of positive action by management, 3) what researchers are doing with the $1 million spent annually to learn about chemistry of the atmosphere, and 4) trends in legislation regarding pollution.

Burner Design

Influence of Port Design and Gas Composition on Flame Characteristics of Atmospheric Burners. Cleveland: A.G.A. Laboratories, 1958.

This study was undertaken to determine the best means of reducing lifting tendencies, yellow tipping tendencies, flashback tendencies and of increasing port depth. Results of first category studied led to multiplying factors for drilled and slotted port burners from which performance characteristics with respect to lifting can easily be determined for burners of various designs operating on fuel gases of different compositions. Study of the elimination of yellow tips resulted in tables of mathematical factors which allow determination of the primary aeration at which yellow tipping will occur for any given burner port geometry and spacing. Investigations of flashback characteristics were limited to only a few large rectangular or slotted port burners. Because of phenomenon of "tilted flames" reproducible results were almost impossible, and a separate study is recommended. Environmental effects on flame characteristics led to five conclusions, with a recommendation that more comprehensive data concerning these effects would aid in appliance burner designs.

Coke Oven Smoke

Clean Air and Coke-Oven Operation. G. Cellan-Jones. *Coke and Gas 20,* 71 (1958) Feb. (4 pp.)

Oven-door gas "bleeding" in units already installed can be relieved by increasing depth of door plug with a gas exhaust channel, interconnecting adjacent standpipes, or a brickwork crown flue, static or mobile, and by fitting self-sealing hopper chutes to the charging car. For new plants, features to be considered are increasing superficial area of brickwork at end flue of the wall, with intensified heating, pyrometrically controlling wall temperatures to insure complete carbonization of charge and better control of coke quenching operation.

Combustion

Combustion Rates in Spherical Reactors: Effects of Inlet Temperature and Fuel Type. M. A. Weiss, R. J. Lang and J. P. Longwell. *Ind. Eng. Chem. 50,* 257 (1958) Feb. (8 pp.)

Extension of earlier work to higher inlet temperatures and to 11 other fuels confirms prediction of activation energy. Combustion rates of fuels in air were measured in well-stirred, spherical insulated reactors. Apparent over-all activation energy was found to be about 45 kcal. Fuels included in the study were isopropyl chloride, methane, xylene,

iso-octane + 5% *n*-propyl nitrate, toluene, heptane, dicyclopentadiene, tetralin, benzene, propylene oxide and hydrogen. Burning rates increased in about the order given. Fuel structure seemed least important for nonaromatic hydrocarbons, more important for aromatics and still more important for nonhydrocarbons.

Safety-Technical Coefficients of Combustible Gases and Vapor. P. Dittmar, *Erdöl u. Kohle 11,* 25 (1958) Jan. (6 pp.)

Energy content and combustion properties of a number of combustible gases are discussed with relation to explosive limits in mixtures with air. Test methods are outlined.

Cooker

Potato Chips Expand Mikesell from a Bicycle to 32 Trucks. F. M. Reiter. *Ind. Gas 36,* 8 (1958) Feb. (3 pp.)

Three cooking machines turn out in excess of 1500 lb/hr of potato chips. Largest machine has a capacity of 750 lb/hr. Its gas capacity: 375 CF, 1000 Btu gas/hr. Gas heat and chips flow in same direction. Eight automatic proportional mixers receive pressure air from their common air blower and draw in their gas through zero governors in the proper quantity to give the length of flames required to give the precise temperature gradient from inlet to discharge end of kettle.

Flame Research

A Study of Sampling of Flame Gases. C. Halpern and F. W. Ruegg. *J. Research Nat. Bureau of Standards 60,* 29 (1958) Jan. (9 pp.)

Study of sampling of hot combustion gases, including CO, CO_2, H_2 and H_2O, by means of water-cooled probes indicated that the sample composition was unaffected by velocity, except that at higher rates of sampling it appears that gradients of composition and temperature caused a decrease in the effectiveness of quenching. Probe material and configuration had little effect on sample composition.

Determination of Oxygen Atoms in Lean, Flat, Premixed Flames by Reaction with Nitrous Oxide. C. P. Fenimore and G. W. Jones. *J. Phys. Chem. 62,* 178 (1958) Feb. (6 pp.)

Average concentration of oxygen atoms in the reaction zone of flat flames $(O)_f$ is measured by adding nitrous oxide to the reactants and assuming that nitric oxide is formed only by $O + N_2O \rightarrow 2NO$. If the rate constant for this reaction is known, $(O)_f$ can be determined from the yield of nitric oxide. The constant is measured by following the same reaction in the burnt gas downstream of the flame where oxygen atoms can be estimated from the balanced reaction of $O + H_2O = H_2 + O_2$. In lean hydrogen or hydrogen plus carbon monoxide flames at 1450-1730°K, $(O)_f$ is 160-2600 times greater than the equilibrium concentration of oxygen atoms in burnt gas.

Some Observations of Flame Stabilization in Sudden Expansions. P. A. Ross. *Jet Propulsion 28,* 123 (1958) Feb. (3 pp.)

Premixed flames stabilized by sudden expansions exhibit oscillatory burning within the region of stabilization when the length-to-diameter ratio of such a configuration is large. Results of an experimental study of such a configuration, conducted to determine effects of oscillatory combustion on stabilization limits, are reported.

Stability of Propane-Air Flames in Vortex Flow. A. E. Potter, Jr., E. L. Wong and A. L. Berlad. *National Advisory Committee for Aeronautics Technical Note 4210,* (1958) Feb. Cleveland: Lewis Flight Propulsion Laboratory. (Order from NACA, Washington, D.C.)

Stability limits of propane-air flames in vortex flow were measured. The blowoff velocity was proportional to the 0.73 power of vortex strength, and increased slightly with fuel concentration. The flames were stabilized by a stagnation or near-stagnation region induced by a pressure defect existing at the vortex center. When the vortex strength was made large, the pressure defect at the vortex center drew ambient air into the flame. This caused partial quenching of lean flames. H_2O_2, HCHO, higher aldehydes, CH_3OH, H_2 and CO were found in combustion products of lean flames in strong vortices.

Furnace Atmospheres

Applications of Furnace Atmospheres. C. E. Peck. *Ind. Heating 24,* Part 2. 2486 (1957) Dec. (4 pp.); Part 3. *Ibid. 25,* 56 (1958) Jan. (5 pp.); Part 4. *Ibid.,* 258 (1958) Feb. (5 pp.)

Appropriate atmospheres for use in annealing carbon, alloy, tool and stainless steels and principal problems involved were discussed in Part 1. (See *Gas Abstracts 13,* 285.) Hardening steels in various types of controlled atmospheres is treated in Part 2. Part 3 covers atmospheres for brazing and sintering and for non-ferrous heat treatments. Concluding section contains a discussion of features of furnaces used with controlled atmospheres, and

includes a table showing atmospheres suitable for heat treatment of metals.

Gas Furnace Explosions

How to Prevent Lighting-Off Explosions in Gas-Fired Industrial Boilers and Furnaces. J. B. Smith. *Gas Age 121,* 18 (1958) Feb. 20 (3 pp.)

Recent study of 83 fuel explosions at heat-treat furnaces over a 10-year period showed that 40 occurred during lighting-off. Of the 40, at least 25 were caused by one or more burner cocks being accidentally left open when main gas valve was turned on. Article describes a gas safety control system which guards against a primary cause of such explosions: premature admission of gas to open burner cocks.

Gas Torch

High Pressure Torch Among Board's Developments. *Gas World 147,* 26 (1958) Feb. 15.

Among recent developments of the North Western Gas Board, Manchester Group, is a high pressure town gas-air torch for use in shipbuilding and engineering industries.

Heat Pump

Maintenance, First Cost Analyses Favor Heat Pump Installation. J. M. Kearney and H. Peters. *Heating, Piping & Air Conditioning 30,* 122 (1958) Mar. (3 pp.)

Air-to-air heat pump system meets zero F outdoor design temperature to provide year 'round cooling, heating. Installation saves equipment space, provides reasonable operating costs. Building must have close humidity control for telephone switchboard components, precise temperature control for occupants.

Heat Treating

Double Heat Treatment Produces Tough Freight Car Wheels. L. DeBoer. *Ind. Gas 36,* 10 (1958) Feb. (3 pp.)

Solution heat diffuses carbides into grains, and a spheroidizing treatment puts cast wheel in condition of high strength and toughness; machining is possible because of structure.

Gas-Fired Economic Re-heating. *Ind. Gas* (British), 16 (1958) Feb. (3 pp.)

Details of furnace system developed to eliminate scale or oxidation while heating steel to forging temperature in a direct fired furnace operating under full automatic control of both temperature and atmosphere. It can be applied to existing or new furnaces for forging, rolling, extrusion or any heating process.

Heating at High Speed. N. H. Davies and R. J. Reed. *Metal Progress 73,* 79 (1958) Feb. (6 pp.)

High-speed heating of metal requires both convection and radiation from furnace gases and walls considerably hotter than finishing temperature. Consequently fast controls are necessary to prevent overheating of the work should the production line slow down.

Incinerators

Smokeless-Odorless Gas Incinerator on Its Way. *Gas Age 121,* 16 (1958) Feb. 20 (3 pp); **'Smokeless-Odorless' Gas Incinerators Open Wide New Domestic Potential.** *LP-Gas 18,* 38 (1958) Mar. (2 pp.); GAMA Presents Revolutionary New Smokeless-Odorless Incinerators at Chicago Show. *Gas Industries 2,* 8 (1958) Mar. (2 pp.)

Seven manufacturers introduce modern gas incinerators which vary considerably in design, but all of which use a "double burning" or "triple burning" technique. After first stage of combustion, waste gases are mixed with air, subjected to heat and flame and rendered inoffensive as they themselves are burned.

Industrial Drying

Gas Stoving Equipment. *Ind. Finishing 10,* 38 (1958) Feb. (3 pp.)

Article is based on a booklet which describes one company's range of industrial ovens, including forced convection ovens, radiant ovens and automatic plant.

Industrial Heating

Reports of the Industrial Gas Development Committee. *Coke and Gas 20,* 81 (1958) Feb. (3 pp.)

Drying of separator plates for accumulators and an example of a large-scale conversion with particular emphasis on a reverberatory aluminum holding furnace are described in this article which summarizes reports recently reviewed by the I.G.D.C.

Industrial Helium

Practices and Methods for Transporting, Handling and Distributing Industrial Helium. F. R. Balcar. *Ind. Heating 25,* 272 (1958) Feb. (4 pp.)

Present and potential value of helium in industrial heating applications makes problem of its supply

an important one. Different degrees of purity are required for various industrial purposes. How trace elements in helium are determined and procedures for handling and distribution of helium to ensure the proper quality of product are disclosed in this article which is an abstract of a paper presented at the Helium Symposium in Anaheim, Calif., June, 1957.

Infrared Burner

Gas Is Used in Infrared Car Thawing. *A.G.A. Monthly 40,* 22 (1958) Feb. (2 pp.)

Infrared generator burns gas on ceramic mat surface. Gas is metered through an orifice, passes through an air aspirating chamber and mixing tube to a chamber under the ceramic mat. This is a 100% primary air burner and the air-gas mixture burns on the surface of the ceramic at a temperature of approximately 1650°F. This installation has resulted in about doubling the dumping rate at the Toledo, Ohio, Lakefront Dock, and has reduced fuel costs by about 40%.

LPG In Food Supply

Propane Powders Bossy's Milk. S. Finney. *Butane-Propane News 20,* 36 (1958) Mar. (2 pp.)

Approximately 1½ billion lb of dry milk were produced in the U. S. last year. Most of the dehydration is still done with steam, giving LPG dealers a wide open field for conversion. One leading dairy company uses propane in at least two of its milk drying plants, testifying to propane's effectiveness in this field.

Revolution on the Pork Chop Front. C. Abell. *Butane-Propane News 20,* 32 (1958) Mar. (4 pp.)

Pig brooding with LPG heat brings five great advantages to pig raisers in cold winter zones. In addition to raising larger litters, it permits reduction of brood sow requirements, matures pigs at peak price period, saves on total labor requirements and moves work peaks out of planting and harvesting seasons.

LPG Promotion

How to Answer Farmers' Question about LP-Gas Weed Control. R. Strawn. *LP-Gas 18,* 35 (1958) Mar. (2 pp.)

Farmers are vitally interested in any products that will increase production and cut costs, too. LPG weed control offers agriculture a tremendous labor and dollar saving tool. Guide on how to forcefully bring these values to the farmers' attention.

How to Increase Over-the-Road Carburetion Sales. D. Reber. *LP-Gas 18,* 41 (1958) Mar. (3 pp.)

Over-the-road market, which includes trucks, buses and taxicabs, accounted for the sale of approximately 60,000,000 gal of LP-Gas last year. But the largest fuel-consuming carburetion potential is still untouched. Pointers on how to build up this trade are given.

Idaho Gas Found Weed Burning Demonstrations Blaze Way to Sales Records. R. Friedman. *LP-Gas 18,* 33 (1958) Mar. (2 pp.)

Sound weed burning program is a key to success in other facets of the LPG business. Article tells how one company demonstrates, sells, rents and services weed burning market.

LP-Gas Promotion Demands Your Support. C. C. Turner. *LP-Gas 18,* 47 (1958) Mar. (4 pp.)

National LP-Gas Council has done a fine job on promotion despite limited funds. But if electric propaganda is to be overcome, everybody must pay his fair share of promotional costs.

Multistory Heating

Consider Altitude Factor in Designing Hot Water Heating. J. J. Blank. *Heating, Piping & Air Conditioning 30,* 114 (1958) Mar. (2 pp.)

Factors affecting maximum design temperature for efficient forced hot water heating of a multistory building are pressure capacity of equipment, barometric pressure, height of topmost part of equipment above the boiler and effect that water friction has on lowering system pressure.

Space Heating

Gas Provides Warmth for 1½ Million People. *Ind. Gas* (British), 6 (1958) Feb. (4 pp.)

North Thames Gas Board, British European Airways and Weatherfoil Heating Systems, Ltd., cooperated in providing a gas supply to the new West London Air Terminal so that the estimated 1,500,000 people passing through will enjoy controlled heating. A six-inch service main runs at right angles to the Underground Railway lines and along the main girders supporting a concrete raft for the terminal. Service pipe is above lower level of girders to allow sufficient headroom for trains below. Vibrations from the railway dictated use of flexible connections.

Small Commercial Consumers and Their Heating Needs. L. F. Randall. *Gas Times 42,* 27 (1958) Feb. (3 pp.)

Survey conducted by the East Midlands Gas Board

(Britain) to determine fuel and appliance needs of some 40,000 small commercial consumers revealed that the potential market represented by these premises has not yet been fully exploited and that consumers themselves are not aware of benefits to be gained by using gas.

Stack Gases

Method for Tracing the Ground-Level Distribution of Stack Gas Emissions. G. F. Haines, Jr., W. C. L. Hemeon and H. Cember. *J. Air Pollution Control Assoc.* 7, 262 (1958) Feb. (4 pp.)

Application of principle recommended requires only two men to handle all details in a survey of considerable magnitude. Technique involves nonradioactive tracer substance having special properties being dispersed in the gas stream to be studied. Upon completion of tests, the field samples are made radioactive by irradiation in an atomic pile and quantity of tracer substances present is determined by measurements of induced radioactivity.

Smoke and Air Pollution. New York: Interstate Sanitation Comm. (1958) Feb.

Report of study conducted in the summer and fall of 1957 in the New York-New Jersey metropolitan area by the Interstate Sanitation Commission through agreement with the U.S. Public Health Service. Recommendations include creation of an administrative body for the control and abatement of interstate air pollution.

Studies of Air Pollution Control by Southern California Edison Company. A. J. Haagen-Smit. *J. Air Pollution Control Assoc.* 7, 251 (1958) Feb. (5 pp.)

Report of research program being conducted in the municipal and industrial fuel-burning installations of Los Angeles to combat air pollution. The ElSegundo Steam Station of the Southern California Edison Company serves as a typical example of the problem and measures undertaken for control.

Water Heating

Gas Water Heating for Factories, Offices and Shops. *Ind. Gas* (British), 12 (1958) Feb. (4 pp.)

Provision of hot water is now considered an essential facility in most industrial and commercial establishments. Gas-fired appliances are one of the most economical, simple and versatile sources of hot water. Some indication of hot water requirements and type of appliances available to meet varying demands efficiently are discussed.

Broiler

Broiler. F. O. Hess (assigned to Selas Corp. of America) U.S. 2,821,127 (1958) Jan. 28.

Broiler design includes cooking chamber walls formed by two radiant ceramic plate, gas-fired heating units.

Burner Design

Burner Tube Assembly for Heat Treating Furnaces. H. N. Ipsen. U.S. 2,822,798 (1958) Feb. 11.

Heat-treating furnace with gas-fired tubes vertically placed around a muffle chamber. Tubes are held at the base by an annular casting and at the top by a movable bellows.

Combination Fluid Fuel Burner. J. T. Black (assigned to Babcock & Wilcox Co.) U. S. 2,822,864 (1958) Feb. 11.

Combination furnace-wall burner is claimed for separate or simultaneous burning of gas, propane or oil, with gas inject from two concentric outer rings whose burner parts are arranged to impinge their flames upon central air-oil injection stream.

Combination Oil-Gas Burner and Gas Burner Adapter for Gun-Type Oil Burner. H. J. Ide and L. D. Schmit (assigned to Synchronous Flame, Inc.) U.S. 2,821,246 (1958) Jan. 28.

Combination oil-gas burner and gas adapter is claimed in which oil burner air tube is replaced by a gas adapter tube carrying a ring manifold and an inner sleeve defining an annular gas-air mixing channel. Air supply for either oil or gas fuel operation remains independently controllable.

Fuel-Air Mixing Tube for Gas Burners. J. W. Dolby (assigned to Configured Tube Products Co.) U. S. 2,824,605 (1958) Feb. 25.

Improved venturi-type tube for bas burner is claimed, with special baffled air-entrance to avoid loss of kinetic energy from entering air and to enable turn-down of burner to very low heat inputs.

Gas Burner. E. M. Michalski (assigned to Combustion Engineering, Inc.) U.S. 2,823,739 (1958) Feb. 18.

High capacity gas burner which obtains as great a range of firing as possible with high combustion efficiency being maintained throughout this range together with attainment of flame stability and with excess air requirements being kept at a minimum.

Gas Burner for Space Heating. L. C. Sassmanhausen. U. S. 2,822,867 (1958) Feb. 11.

Gas burner structure is claimed for use as a conversion or replacement burner in existing space heater furnaces. Rigid frame carries burner feed

tube and pilot tube, which are slidably mounted for easy servicing.

Gas Burner System. C. W. Morck, Jr. (assigned to Selas Corp. of America.) U. S. 2,823,740 (1958) Feb. 18.

Provision of a large capacity gas burner with an exceptionally high turn-down ratio that will perform as well when operating at minimum fuel rates as it will at maximum fuel rates. Air supply is varied in accordance with fuel supply. System permits combustion process to be carried out efficiently at any point within range of burner operation.

Internally Fired Tubes for Heating Furnaces or Other Purposes. J. Fallon. U. S. 2,823,659 (1958) Feb. 18.

Jet burner is mounted in the center of a triple pipe union to fire down a central tube, with combustion gases flowing from far end of central tube through a similar return bend union and through pipes parallel to the center pipe to permit balanced recirculation and exhaust of hot gases.

Cookers

Cooking Range. A. H. Brodbeck (assigned to Magic Chef-Food Giant Markets, Inc.) U. S. 2,823,657 (1958) Feb. 18.

Range is claimed with a cover for the griddle which is adapted to be swung from a position overlying the griddle for keeping griddle clean when not in use to an out-of-the-way position when in use. Griddle cover when removed may be used as a tray or pan.

Cooking Range. W. H. Holzboog and F. H. Heselmeyer (assigned to Magic Chef-Food Giant Markets, Inc.) U.S. 2,823,660 (1958) Feb. 18.

Provision of an improved means for effecting a tight seal between oven door and front wall of a cooking range comprising heat-resistant sealing strips and means for mounting strips to be readily removable and replaceable when necessary without requiring disassembly of any parts of the range. Seal described must be economical and easy to install.

Ore Reduction

Process for Reduction of Iron Ore. F. B. Sellers (assigned to Texaco Development Corp.) U.S. 2,821,471 (1958) Jan. 28.

Iron oxide is reduced by a high hydrogen gas in a reducing zone. This gas is generated by a water-gas shift conversion of carbon monoxide with steam to form $CO_2 + H_2$. The iron ore itself is used as the shift catalyst. Spent iron catalyst is added to the reducing zone feed.

Pilot Lights

Burner Pot Pilot. J. M. Redmond (assigned to Coleman Co., Inc.) U.S. 2,822,036 (1958) Feb. 4.

Development of a burner which, with a minimum amount of fuel, is effective in providing flame when needed while maintaining the flame in a sheltered and reversed position when there are heavy down-currents of air, and to provide an effective means for preventing the creeping of oil from under the bottom edges of pilot structure. Pilot box has an open rear side supported adjacent to burner wall to form an enclosure about the oil inlet opening and air openings.

Pulsating Oil Burner

Pulsating Combustion Burner Appliance. J. E. McCutchen (assigned to Coleman Co., Inc.) U.S. 2,822,037 (1958) Feb. 4.

Invention of a lightweight heating device capable of producing exceptionally high heat outputs under extremely adverse conditions, of being operated on gravity or capillary feed with a minimum amount of smoking on a wide variety of liquid fuels, and of burning liquid fuel with explosions which occur in a pulsating regular manner. It is comprised of a wick housing, a bundle of elongated wicks, in said housing, surrounded by an air baffle with a opening which provides a perimetric air-intake port.

Radiant Burner

Gas Burning Radiant Heating Unit. H. D. Sterick. U. S. 2,822,799 (1958) Feb. 11.

Steel wool mat of loose fibers is impinged by gas flames and reflects radiant heat downward from its incandescent lower surface, while the upper metal casing is held relatively cool.

Refrigerator

Refrigeration. N. E. Berry (assigned to Arkla Air Conditioning Corp.) U.S. 2,822,673 (1958) Feb. 11.

Low-pressure refrigerating unit uses solution columns to balance pressure between high and low pressure sides, as in the lithium bromide-water unit, while maintaining a reasonable over-all height of unit. This is accomplished by use of a transfer vessel in the flow circuit of strong refrigerant from the absorber, which permits intermittent flow to the generator base by means of a liquid trap to stop and start the vapor flow.

Water Heater

Dual Tank Water Heater. E. E. Flynn. U. S. 2,823,649 (1958) Feb. 18.

Heater claimed can be fabricated of any suitable material providing it meets proper heating and plumbing codes. Device includes two separate, independent storage areas so that water under different temperatures and pressures can be supplied from the same unit. Common source of heat can be used for both compartments so that purchase of two separate water heaters will not be necessary.

10. EQUIPMENT AND INSTRUMENTATION

Automatic Controls

Algebraic Approach to Design of Automatic Controls. R. Oldenburger. *ASME Trans. 80,* 433 (1958) Feb. (11 pp.)

Application of certain procedures, including a right to left synthetic division, to algebraic equations enables the engineer to approximate some of the roots, after which the solution for all of the roots can be readily obtained. From the roots it is possible to determine what the transients will be. Author's method is applied to the design of a governor for a gas turbine.

Statistical Treatment of Sampled-Data Control Systems for Actual Random Inputs. M. Mori. *ASME Trans. 80,* 444 (1958) Feb. (13 pp.)

Fundamental statistical relations of sampled-data control systems in terms of the correlation of functions of time series, pulse spectral densities and modified z-transform. Modified z-transform method can be applied to the statistical treatments in the paper to determine signals between sampling instants. Relation between this method and analysis on the basis of variable-system theory is proved.

Balances

New Types of Recording Differential Thermobalances. P. L. Waters. *J. Sci. Instruments 35,* 41 (1958) Feb. (6 pp.)

Two types of thermobalances which automatically record differential and cumulative weight losses during pyrolysis of samples both convert displacement of balance beam due to changes in sample weight into an electrical signal. Amplified signal operates servo-mechanism which applies counterbalancing force at necessary rate.

Fractionation

Progress in Absorber and Fractionator Tray Design. *Chem. & Process Eng. 39,* 41 (1958) Feb. (7 pp.)

Recent developments in design of trays for fractionation and absorber towers offer effective competition to bubble-cap plates, long-term standard in refinery service. In many applications, new types, including the *Turbogrid, Uniflux* and *Flexitray,* offer greater simplicity, better operating flexibility, ease of maintenance and lower initial cost than can be realized with bubble-cap trays.

Fractionator Tray Design

Perforated Trays. C. J. Huang and J. R. Hodson. *Petrol. Refiner 37,* 103 (1958) Feb. (16 pp.)

Comprehensive assimilation of most reliable information available for design of perforated trays. Handy work sheets to carry out actual design calculations included. Many equations reduced to nonograms to enable easier computations for picking optimum design. Sample problem demonstrates how nonograms enable examination of a number of different tray situations quickly. Performance chart can aid in prediction of range of satisfactory operation; it can also be used to rate an existing installation.

Flow Velocity

A Linear, Unidirectional Anemometer of Rapid Response. R. J. Taylor. *J. Sci. Instruments 35,* 47 (1958) Feb. (6 pp.)

Heated wire dissipating constant power causes temperature changes in air moving past it which vary inversely with wind speed. These temperature variations are detected by a thermometric bridge and, by means of a circuit with feedback control, an electrical signal is constructed which is linearly related to velocity. Resulting anemometer is sensitive only to normal velocity component and, by combining two such anemometers, changes in sign of this component can be accommodated.

Gas Turbines

Gas Turbines for Process Applications. D. F. Bruce. *Mech. Eng. 80,* 75 (1958) Mar. (4 pp.)

Gas turbine's place in industry can be measured by number of units in operation. While successful experimental gas-turbine units were available in the 1930's, it wasn't until 1945 that commercial installations were really started. In the following decade, approximately 125 units were placed in operation. By comparison, 1956 and 1957 witnessed an equal

number of a greater combined horsepower scheduled for installation than in the preceding 10 years. Many of the applications have been repeat orders showing that the gas turbine has proved itself in actual service, and that it should therefore play an ever-increasing role in providing power, compressed air, hot gases or other needs for process industries.

Hazards Instrumentation

Instruments for Use in Occupational Hygiene. C. N. Davies. *J. Sci. Instruments 34,* 425 (1957) Nov. (11 pp.)

Highlights of the papers presented at the British Occupational Hygiene Society Conference. Topics covered include sampling for measurement or for control, study of atmospheric pollution; explosions in mines, precautions against dust disease, nondestructive testing of pit gear, chest X-ray as an index of dust disease, X-ray exposure meters, instruments for respiratory physiology, estimate of toxic vapors, absorption spectrometry, infrared instruments, control of health risk due to radioactivity, types of radiation counters, monitoring techniques, exposure to neutrons, criticality accidents and internal radiation and whole body monitoring.

Hygrometer

Recording Microwave Hygrometer. J. B. Magee and C. M. Crain. *Rev. Sci. Instruments 29,* 51 (1958) Jan. (4 pp.)

Rapid response microwave hygrometer for continuously recording water vapor pressure of atmospheric air over a wide ambient range employs a principle which involves measurement by means of a cavity resonator of contribution of water vapor to refractive index of atmospheric air. Device also has potential application to continuous measurement of the degree of contamination of one gas (or of gas mixtures) by another gas (or gases).

Manometer

Description of a Sensitive Micromanometer. R. Eichhorn and T. F. Irvine, Jr. *Rev. Sci. Instruments 29,* 23 (1958) Jan. (5 pp.)

Micromanometer for measurement of differential pressures greater than 10^{-4} in. of water with reasonable accuracy uses concentric tubes to form fluid passaages and provides for remote indication of level in central tube by means of a mirrored float and telescope and scale arrangement. Highest sensitivity attained was 3.15×10^{-5} in. of water applied pressure/mm of scale reading, but with suitable refinement in the optical system it is believed that greater sensitivities are possible.

Piping Labor

How Many Manhours Required for HPAC Installation Work? *Heating, Piping & Air Conditioning 30,* 100 (1958) Mar. (2 pp.)

Tabular breakdown of estimated manhours required for performing piping operations (for pipe sizes most frequently installed in industrial plants), estimated manhours for applying pipe insulation and estimated installed costs for piping systems.

Pressure Measurements

Recent Advances in Dynamic Pressure Measurement Techniques. F. F. Liu and T. W. Berwin. *Jet Propulsion 28,* 83 (1958) Feb. (5 pp.)

Review of some recent advances in pressure measurement as it pertains to rocketry, gas dynamics and nuclear kinetics research. Brief description of several techniques developed by authors for measuring high speed pressure transients also is included.

Pumps

Vertical Pumps . . . Finding Many New Process Applications. J. P. Cannon and J. A. Lundquist. *Chem. Eng. 65,* 139 (1958) Mar. 10 (4 pp.)

Vertical volute pump, because of technological advances and some expert advice, is coming into its own. It is self-priming, self-draining, permits submerged operation and provides safe operation. Stuffing box leakage has been eliminated and a host of new bearing materials are now available.

What Is This NPSH? V. Labanoff. *Oil Gas J. 56,* 121 (1958) Feb. 24 (4 pp.)

Before entering liquid eye of a centrifugal pump liquid must overcome pipe friction, hydraulic shock loss, prerotation and velocity head. To keep liquids from boiling at impeller entrance, a sufficient static head, above vapor pressure, must be provided to overcome losses or barriers. This static head above vapor pressure is called net positive suction head (NPSH). Influence of many variables on NPSH and on design and selection of pumps is discussed.

Thermocouples

Designing Thermocouples for Response Rate. R. J. Moffat. *ASME Trans. 80,* 257 (1958) Feb. (4 pp.)

Empirical equation for determination of characteristic time (response performance of a probe) is developed in terms of the geometry and flow conditions. Equation predicts characteristic time within 10% for bare wireloop-junction thermocouples

from 0.016-0.051 in. diam wire, mass velocities from 3-50 lb/sec ft² and temperature from 160°-1600°F. Effects of manufacturing tolerances and engine environmental conditions also were investigated.

Refinery Instruments

New Trends in the Instrumentation of Refinery Processes. S. W. J. Wallis and D. S. Townsend. *J. Inst. Petrol. 44,* 29 (1958) Feb. (12 pp.)

Information, communication, evaluation and action are keys to successful operation of any organization. Article reviews current methods of process control, pointing up their shortcomings, development of new techniques and equipment necessitated by a need for change in approach to control methods and possibility of achieving objective in a completely automatic plant.

Sterilizer

Sterilizes Efficiently with Gas. *Chem. Processing 21,* 196 (1958) Mar. (2 pp.)

Equipment, which consists essentially of a sterilizing chamber and automatic controls for gas cycle of a mixture of 20% ethylene oxide and 80% CO_2, permits sterilizations to be performed rapidly at low temperatures and optimum humidity conditions.

Flowmeter

Flow Control Devices for Flowmeters. M. D. Altfillisch, G. S. Cherniak, H. A. Powers and R. B. White (assigned to American Radiator & Standard Sanitary Corp.) U.S. 2,821,084 (1958) Jan. 28.

Improved accuracy is obtained in a gyroscopic mass flowmeter where measured torque factor depends on fixed radius of rotating mass comprised in a coil of tubing through which fluid is flowing, by inserting a guide such as a twisted rigid ribbon or twisted bundle of fine tubes which prevents centrifugal separation of fluid and resulting change of radius.

Gas Producer

High Pressure Gas Producers. H. Gruber (assigned to Koppers Co., Inc.) U. S. 2,823,103 (1958) Feb. 11.

High-pressure gas producer has been developed with cylindrical walls formed by adjacent abutting metal tubes of square section to carry coolant liquids. Tubes, held in adjacent position by tension rings, are fed and drained of coolant by upper and lower header rings which seat on a flanged-out refractory-metal sheet liner for the gasification shaft, such seats carrying the top and base.

Heat Exchanger

Combination Heat Exchange Head and Combustion Chamber. G. B. Herbster (assigned to Herbster-Schmiler, Inc.) U. S. 2,823,658 (1958) Feb. 18,

Heat exchanger is claimed in which exchange head is comprised of a nest of horizontal tubes flattened into arcuate shape with spaces between them which carry a rising cross flow of combustion gases while the tubes carry forced flow of fluid receiving heat.

11. MATERIALS OF CONSTRUCTION, AND CORROSION

Aluminum

Aluminum Alloy Castings. J. L. Everhart. *Materials in Design Eng. 47,* 125 (1958) Feb. (20 pp.)

Special report on properties and uses of sand, permanent mold, die and other types of castings. Provides a useful summary of specifications, engineering properties, design considerations, processing characteristics and applications.

Cathodic Protection

Cathodic Protection in Industrial Refrigerating Plant. L. Piatti and H. Bourquin. *Eng. Digest 19,* 59 (1958) Feb. (2 pp.) (From *Sulzer Technische Rundschau 39,* 31 (1955) No. 4 (7 pp.)

Discussion of sacrificial protection and cathodic protection by external current. In first method, an anode of zinc or magnesium is introduced into electrolytic medium, the metal to be protected then acting as a cathode while the expendable anode corrodes in its place. Second method uses a negative voltage from a d.-c. source on the metal to be protected, preventing development of anodic points on its surface.

Controlling External Corrosion on the Trans-Arabian Pipeline. *Corrosion 14,* 100 (1958) Mar. (3 pp.)

Details of cathodic protection methods used on Trans-Arabian pipeline. Unattended crude oil burning Diesel-driven generator stations are used as source of rectifier power at points distant from terminals. Ground beds require watering during dry season. Silicon cast iron anodes will be used to replace steel-rail anodes in marine system protection. Barges, tugs, piers and buoys are protected by magnesium anodes.

The Use of Magnesium for the External Cathodic Protection of Marine Vessels. C. F. Schreiber. *Corrosion 14,* 126t (1958) Mar. (5 pp.)

Experimental studies, conducted over a 5-year interval, of magnesium anodes for external cathodic protection of marine vessels indicate effective results with distributed anode system. Variables of anode weight, optimum length and number of anode strings are related to a one or two-year anode life. Absence of marine fouling over the same period is discussed. Cost data for cathodic protection of ships are given and compared with maintenance costs of unprotected ships.

Cermets

New Alumina-Type Cermets. T. F. Frangos. *Materials in Design Eng. 47,* 112 (1958) Feb. (4 pp.)

Aluminum oxide family of metal-ceramics has acquired two new types which provide high temperature strength (even above 2300°F) and resistance to molten metals, chemicals, oxidation, wear and high temperature erosion.

Coatings

High Temperature Coatings. *Ind. Finishing 10,* 34 (1958) Feb. (3 pp.)

Protective finishes for high temperature materials now used in aircraft and missiles have three categories—metallic coatings, paints and ceramic coatings. Most commonly used metals for high temperature application are aluminum, chromium, nickel, silicon, copper, silver, rhodium, tungsten, molybdenum and stainless steel alloys. Article discusses latest developments in use of these protective coatings.

Performance of Epoxy Resin Coatings in Marine Environments. F. A. MacDougall. *Corrosion 14,* 93 (1958) Mar. (4 pp.)

Performance of epoxy-resin formulations in atmospheric and submerged marine environments is discussed. Formulations in incorporating esters, amine cured, polyamide cured and coal tar formulas are discussed with respect to surface preparation, primers, coating systems and application problems common to the Gulf Coast. Comparison of coating costs on three self-contained drilling platforms is included.

Which Coating at High Temperature? G. D. Oxx, Jr. *Product Eng. 29,* 61 (1958) Jan. 20 (3 pp.)

Extra demands are imposed on most materials by high temperatures, and protective coatings are no exception. Above 1000°F, environment starts doing its worst damage to metals. Guideposts to types best for corrosion resistance, erosion resistance and compatibility with base metal are included.

Corrosion

Chemical and Electrochemical Affinities of Corrosion Processes. P. van Rysselberghe. *Corrosion Tech. 5,* 49 (1958) Feb. (5 pp.)

Outline of analysis of corrosion reactions is made possible by using concepts of chemical and electrochemical affinities and principles of equilibrium thermodynamics and thermodynamics of irreversible processes. Presentation is based on a typical example, that of metallic zinc undergoing corrosion in aqueous media.

Corrosion Meter Slashes Time for Corrosion-Rate Determinations. T. W. Wett. *Chem. Processing 21,* 172 (1958) Mar. (2 pp.)

Materials testing to determine corrosion rates is accomplished by a meter which utilizes electricity to follow corrosion progress. Circuit is so constructed that ratio of resistance of corroding element to that of non-corroding element is translated directly into micro-inches or mils of metal lost.

Corrosion. Some Aspects of Surface Preparation. J. H. Cogshall. *Pipe Line News 30,* 68 (1958) Feb. (3 pp.)

Article surveys range of commonly accepted methods of surface preparation as they apply to maintenance painting in chemical process plants. Advantages and drawbacks of various methods are pointed out. Possibilities are explored of a novel method of chemical surface preparation that holds considerable promise for upgrading maintenance painting in areas where acceptable standards of surface preparation cannot be used.

High Temperature Hydrogen Sulphide Corrosion in Commercial Sovaformer Units. E. B. Backensto, R. D. Drew and J. N. Vlachos. *Corrosion Tech. 5,* Part 1. 21 (1958) Jan. (5 pp.); Part 2. *Ibid.,* 53 (1958) Feb. (3 pp.)

Hydrogen sulfide corrosion, a serious problem in some catalysts, is treated in Part 1. An iron sulfide scale which forms at high temperatures is a product of this corrosion. This scale will spall off during changes in operating conditions. Resultant unit downtime and cleaning procedures are costly. In Part 2, corrosion test results obtained in the second commercial sovaformer (static-bed reformer utilizing a platinum-type catalyst) are discussed. Data obtained, on a variety of commonly used steels, agree well with data obtained in the laboratory.

Corrosion and pH

Effect of pH on Corrosion Potentials. I. A. Ammar and S. Riad. *J. Phys. Chem. 62,* 150 (1958) Feb. (5 pp.)

Dependence of the potential of a corroding metal on the *p*H of solution has been investigated. This has been done by considering the recent aspects of the kinetics of hydrogen evolution and metal dissolution, and expressions for the corrosion potential E_c have been deduced under the condition when the reverse rates for the cathodic and the anodic reactions can be neglected. Expressions derived for (dE_c/dpH) have been tabulated. Effect of oxygen on corrosion potentials has also been studied by considering the cathodic reaction, in presence of oxygen, to be the reduction of oxygen by discharged hydrogen.

Corrosion Measurement

The Copper Sulfate Electrode. G. N. Scott. *Corrosion 14,* 136t (1958) Mar. (5 pp.)

Some practical aspects of the saturated copper sulfate electrode are discussed. For purposes of illustration and for comparison with an experimentally determined and commonly accepted value, the electrode potential is calculated from thermo-dynamic data. Simple field tests to evaluate effects of temperature, polarization, contamination, acidification, dry-earth contacts and like topics are described. Some tests of direct burial electrodes are given.

Some Considerations in the Design and Application of an Electrical Resistance Corrosion Meter. G. A. Marsh and E. Schaschl. *Corrosion 14,* 155t (1958) Mar. (4 pp.)

Considerations in design of a direct-reading corrosion meter using temperature-compensated electrical resistance specimens or probes are discussed. Several laboratory and field applications are described. One principal advantage of the probe method is that it enables operator to make measurements while corrosion is proceeding without interrupting the test and without making separate temperature corrections or calculations. Method cannot be used to measure pitting.

Use of a Condensate-Corrosion Tester for the Survey of Return-Line Deterioration. A. A. Berk. *Corrosion 14,* 141t (1958) Mar. (4 pp.)

Description of a condensate-corrosion tester used by the Bureau of Mines to determine the economic advisability of chemically protecting condensate return piping in various area heating plants. More than 1000 of these testers have been issued to Federal heating plants and several hundred have been returned for evaluation. Much has been learned about improving operating practices in relation to corrosion control. Also, a much improved definition has been given to the conditions of effective use of chemical treatments for controlling return-like corrosion.

Graphite Equipment

Estimate Cost of Graphite Equipment. J. Reys. *Chem. Eng. 65,* 137 (1958) Feb. 24 (6 pp.)

Charts for use in making cost estimates are given for each of the major types of standard impervious graphite equipment. Costs shown are based on figures for January 1957. Although there may be some variation between estimated costs and those quoted by a manufacturer, the prices are accurate and are designed for use in actual estimating work.

Inhibitor

Study of the Compatibility of Floating-Type Inhibitors and Cathodic Protection. E. R. Streed. *Corrosion 14,* 150t (1958) Mar. (5 pp.)

Individual applications of floating-type inhibitors and cathodic protection for corrosion mitigation of steel floating drydock ballast compartments have shown promising results in specific areas of the compartments. Theoretical considerations and results of simultaneous use of both methods in an experimental study are described.

Piping Materials

Check Requirements, Design Factors When Choosing Piping Materials. O. N. Dudkin and F. F. Pfeiffer. *Heating, Piping & Air Conditioning 30,* 125 (1958) Mar. (2 pp.)

Selection of the proper piping to meet today's chemical and other processing applications requires careful consideration of such factors as corrosion, erosion, temperature and pressure, product contamination and, where applicable, special problems common to nuclear power piping.

Porcelain Enamels

Porcelain Coatings on Steel. L. E. Fussell and H. P. Tripp. *Product Eng. 29,* 75 (1958) Feb. 17 (3 pp.)

Lower firing temperatures and new enamels reduce costs and permit a single coating for ordinary cold-rolled steel. Basic facts on coatings with porcelain enamel are included.

Resistance Alloys

How to Select a Resistance Heating Alloy. R. J. Fabian. *Materials in Design Eng. 47,* 104 (Feb.) (5 pp.)

Useful survey of five principal groups of resistance alloys — nickel-chromium, nickel-chromium—I, nickel-chromium — II, iron-chromium-aluminum-cobalt and molybdenum disilicide — available for electrical heating, including their properties, costs and uses.

Solar Absorptivity

Measurements of the Total Absorptivity for Solar Radiation of Several Engineering Materials. R. C. Birkebak and J. P. Hartnett. *ASME Trans. 80,* 373 (1958) Feb. (6 pp.)

Values of total solar absorptivity of several porous materials being considered for transpiration cooling of high-speed vehicles are presented. For surface specification, photomicrographs and a chemical analysis are presented. Two schemes used in the measurement of the absorptivity values—a comparison technique and an integrating radiometer method—are described.

Thermal Conductivity

Thermal Conductivity Apparatus for Operation Near Room Temperature. J. T. Gier, R. V. Dunkle and J. T. Bevans. *Refrigerating Eng. 66,* 39 (1958) Mar. (4 pp.)

Determination of thermal conductivities of materials used in engineering practice is of fundamental importance to heat transfer. Article describes an inexpensive apparatus for rapid determination of thermal conductivity of solids near room temperature. The apparatus is applicable in testing laboratories and in production control. The equipment described and some of the experimental data obtained with the equipment are presented. A comparison of the results is made with those reported by other investigators.

Inhibitor

Weighted Corrosion Inhibitor. O. L. Riggs, Jr. and A. A. Shock (assigned to Continental Oil Co.) U.S. 2,822,330 (1958) Feb. 4.

Provision of a method of inhibiting corrosion in producing oil wells in which corrosion inhibitor is weighted with a liquid to make it fall more readily through any liquid column to a producing zone in a well. Immiscibilizing agent can be either a nonionic surface active compound having a hydrophile-lipophile balance with the range of 13.5-15.5 or a polyoxyethylene sorbitan mono-oleate.

12. ANALYTICAL METHODS AND TESTS

Adduct Processing

Paraffins from the Crude of Cortemaggiore Produced by Urea Treatment. M. Panetti and R. Gay. *Revista dei Combustibili 11,* 797 (1957) Dec. (14 pp.)

The n-d-M method and Leithe's n-paraffin assay were used in an analysis of the various fractions obtained by vacuum-column distillation of the product obtained when processing Cortemaggiore crude oil with urea. Experimental data were used to determine structural composition of individual fractions (naphthene, isoparaffin and paraffin) and to corroborate by simple computation the suggestion put forward in a previous note concerning the arrest in adduct formation reaction.

Air Pollution Methods

Measurement of Air Pollution. London: Dept of Sci. and Ind. Research, 1957.

Determinations of the following types of pollutants were made: deposited matter (with British standard deposit gage), sulfur dioxide (by first lead peroxide and then volumetric apparatus methods) and smoke or suspended matter. Method of each determination and summary of findings are given.

Air Sampling

Results of Three Years of Operation of the National Air Sampling Network. A. C. Stern. *J. Air Pollution Control Assoc. 7,* 284 (1958) Feb. (5 pp.)

Determination, by chemical means, of the amount of protein in pollen and other materials suspended in air was initiated in 1953. Approximately 70,000 ft of air was filtered through an 8 by 10 in. flat filter over a 24-hr period. A vacuum cleaner type exhauster was used. Chemical procedures were devised to determine the protein content of the material on the filter.

Carbon-Hydrogen Determination

Rapid and Precise Carbon-Hydrogen Determination. Automatic Macrocombustion Apparatus. T. T. White et al. *Anal. Chem. 30,* 409 (1958) Mar. (6 pp.)

Automatic combustion apparatus permits rapid

and precise macrodetermination of carbon and hydrogen with minimum of operator training and attention. A manometer control mechanism monitors pressure in combustion tube and controls the heater and cooling air blast used to maintain desired rapid sample vaporization rate. Combustion cycle requires about 20 minutes.

Chromatography

Chromatography of a Mixture of Hexane, Chloroform and Benzene on Silica Gel. J. W. Blair and E. S. Amis. *Anal. Chem. 30,* 329 (1958) Mar. (5 pp.)

Increase of free water content in silica gel decreases its resolving power in chromatographic fractionation of a hexane, chloroform, benzene mixture because it decreases adsorption. Three compositions were separated from the mixture by silica gel.

Gas-Liquid Chromatography. Part 1. Retention-Volume Data of Certain Tar Acids. L. Irvine and T. J. Mitchell. *J. Appl. Chem. 8,* 3 (1958) Jan. (4 pp.)

Corrected retention volumes per gram of stationary phase (V_g) are given for 30 tar acids at 183°, 155° and 135°C. Results were obtained from a 4-ft column using Apiezon-L stopcock grease as stationary phase and Celite-535 as mechanical support. Nitrogen was used as carrier gas and thermal conductivity was used for detection of constituents.

How Gasoline Plants Are Using Gas Chromatography. A. J. Miller. *Oil Gas J. 56,* 88 (1958) Mar. 3 (4 pp.)

One petroleum company discovered it could keep tab practically up to the minute on plant recovery efficiency and observe the effects of even small changes in operating variables, such as weather temperatures.

Resolution in Gas-Liquid Chromatography. D. Brennan and C. Kemball. *J. Inst. Petrol. 44,* 14 (1958) Jan. (4 pp.)

In a study of some of the factors which influence resolution achieved in gas-liquid chromotography, particular attention was given to the importance of the pressure and length of column employed.

Resolution of Isomeric Hexanes by Gas-Liquid Chromatography. A. Zlatkis. *Anal. Chem. 30,* 332 (1958) Mar. (2 pp.)

Hexane isomers can be rapidly resolved by gas-liquid chromatography using new column packings consisting of heterocyclic amine on Celite. Resolution of 2, 3-dimethylbutane and 2-methylpentane is achieved in 15 minutes, while all hexane isomers can be separated in less than 30 minutes.

Some Factors Influencing the Efficiency of Gas-Liquid Partition Chromatography Columns. W. J. deWet and V. Pretorius. *Anal. Chem. 30,* 325 (1958) Mar. (5 pp.)

A study has been conducted of the effect of the following parameters on efficiency of a gas-liquid partition chromatographic column: nature and velocity of carrier gas, column temperature, particle size of solid support, density of packing and amount of liquid phase used. Results agree well with rate theory of van Deemter, Zuiderweg and Klinkenberg.

Electrochemical Methods

Electrochemical Methods for Process-Stream Analysis and Control. T. C. Wherry and D. D. DeFord. *Control Eng. 5,* 115 (1958) Mar. (7 pp.)

Versatile electrochemical and titrimetric analytical methods, common in the laboratory, have not yet been extensively utilized on continuous processes in the plant. Reason: limited understanding of their capabilities and lack of commercially available instruments. Purpose of article is to focus attention on electroanalytical techniques and give impetus to their application in continuous process control.

Hydrocarbon Analysis

Ring Analysis and Branching Analysis of Saturated Hydrocarbons. C. Boelhouwer and H. I. Waterman. *Fuel 36,* 481 (1957) Oct. (12 pp.)

Revised graphical method for analysis of saturated hydrocarbon mixtures based solely on reliable physical data of pure *n*-alkanes, *n*-alkyl *cyclo*pentanes and *n*-alkyl *cyclo*hexanes. Method is especially useful for analysis of branched and non-branched saturated hydrocarbon polymers, isomerized paraffin waxes and hydrogenated mineral oil fractions. Graphs enable accurate determination of average number of rings per molecule and approximate estimation of degree of branching with the aid of the specific refraction, specific parachor and the molecular weight.

Infrared Gas Tester

Infrared Analyzer 'Spots' Troubles in Gas Streams. J. R. Phillips. *Chem. Processing 21,* 142 (1958) Mar. (3 pp.)

Infrared gas analyzer of non-dispersive design, operating on principle of absorption comparison, permits rapid diagnoses of gas streams for impurities. Sampling manifold arrangement located in gas purification unit permits instrument to monitor carbon monoxide, carbon dioxide and methane content of hydrogen-nitrogen streams.

Lube Oil Additives

Analyze for Ba, Ca, and Zn This Way. R. J. Bertolacini. *Petrol. Refiner 37,* 147 (1958) Feb. (3 pp.)

Fast and precise method to aid in the determination of barium, calcium and zinc in lube additives and oils.

Mass Spectrometry

Application of Total Ionization Principles to Mass Spectrometric Analysis. G. F. Crable and N. D. Coggeshall. *Anal. Chem. 30,* 310 (1958) Mar. (4 pp.)

An analytical expression relating total ionization per mole to molecular weight has been derived from relative ionization cross-section study of Otvos and Stevenson. This equation predicts that total ionization data for homologous hydrocarbon series are linear functions of molecular weight having same slope. Through use of total ionization curves and published spectral patterns, sensitivities applicable to any instrument can be calculated.

Low Voltage Techniques in High Molecular Weight Mass Spectrometry. H. E. Lumpkin. *Anal. Chem. 30,* 321 (1958) Mar. (5 pp.)

Mass spectra of double-bond-containing molecules can be greatly simplified by lowering ionizing voltage so that energy available is sufficient to form molecule ion, but too low to form fragment ions. Use of this technique in higher boiling ranges of petroleum simplifies interpretation of spectra. Calibration data and applications are included.

Mass Spectrometer-Type Analysis for Olefins in Gasoline. L. Mikkelsen, R. L. Hopkins and D. Y. Yee. *Anal. Chem. 30,* 317 (1958) Mar. (5 pp.)

Benzenesulfenyl chloride reacts quantitatively with olefins in a hydrocarbon mixture to form a high boiling addition product which does not contribute to mass spectrum of the nonolefinic components. By comparison of mass spectra before and after treatment with this reagent, the olefin monocycloparrafin, coda and dicycloparaffin mass peaks may be determined independently.

Moisture Determination

Magnetic Resonance Determines Moisture. T. F. Conway and R. J. Smith. *Electronics 31,* 51 (1958) Feb. 28 (3 pp.)

Absorption of radio-frequency energy by the nucleus of a hydrogen atom placed in a constant magnetic field is the principle used to measure moisture content in hygroscopic solids. Non-destructive analysis of raw materials and end products can be conducted by nontechnical personnel and is accurate within 0.2% and may take only 30 sec to complete.

Nitrogen Dioxide Determination

Continuous Sampling and Ultramicrodetermination of Nitrogen Dioxide in Air. M. B. Jacobs and S. Hochheiser. *Anal. Chem. 30,* 426 (1958) Mar. (3 pp.)

Simple, convenient method has been developed for continuous sampling and ultramicrodetermination of nitrogen dioxide in urban atmospheres. Air is aspirated through 0.1*N* alkali and absorbed nitrogen dioxide is determined colorimetrically as the azo dye. Sulfur dioxide which reduces the color is removed by oxidation with hydrogen peroxide.

Nondestructive Testing

Nondestructive Testing. S. Elonka. *Power 102,* 115 (1958) Mar. (23 pp.)

Ten of the more important methods of nondestructive methods are discussed in terms of jobs they will do. Included are X-ray, isotope radiography, fluoroscopy, ultrasonic, immersion, resonance, eddy-current, magnetic particle, black light and penetrant tests.

Olefins by Bromine Number

Influence of Olefin Structure on Bromine Number as Determined by Various Analytical Methods. E. H. Unger. *Anal. Chem. 30,* 375 (1958) Mar. (6 pp.)

Three ASTM methods of determining olefins by bromination have been critically surveyed. A total of 45 API standard olefins were analyzed and relationship between structure type of olefin and bromine number was examined. It is concluded that modified electrometric method, which omits mercuric chloride catalyst, is best.

Organic Sulfur

Gas-Liquid Partition Chromatography of Organic Sulphur Compounds. C. H. Amberg. *Can. J. Chem. 36,* 590 (1958) Mar. (3 pp.)

Relative elution times of several organic sulfur compounds have been measured by gas-liquid chromatography to assist in their identification in cracked distillates derived from Canadian crudes. Results have been tabulated.

Oxygen Determination

Oxygen Analysis and Combustion Control. J. C. Farquhar. *Fuel Efficiency 6,* 30 (1958) Jan. (3 pp.)

New types of analysis controllers, now on the market, have led to an increased use of the system of control of the products of combustion by continuous oxygen analysis and to greater efficiency in many operations.

Petroleum

Wet Ash Spectrochemical Method for Determination of Trace Metals in Petroleum Fractions. J. Hansen and C. R. Hodgkins. *Anal. Chem. 30,* 368 (1958) Mar. (5 pp.)

Copper metal powder can be successfully used as a carrier-matrix for spectrochemical determination of vanadium, nickel and iron in wet ash residues of petroleum fractions. As little as 0.05 ppm of nickel and vanadium can be determined in a 10-g sample. Techniques are given for both photographic and direct reading instruments.

Petroleum Analysis

Modern Trends in Petroleum Analysis. H. Powell and W. H. Thomas. *J. Inst. Petrol. 44,* 19 (1958) Feb. (10 pp.)

Most important trend is toward automatic physical methods of analysis, whereby much more information may be obtained in a shorter period of time. Newer types of equipment are expensive but their cost is offset by increased amount of information obtained and savings affected in refinery operation, notably reduction in tanker delays and overlong occupation of tanks whose contents cannot be removed until time-consuming analyses are completed.

Radioisotopes

Making Labeled Compounds. Chemical Effects of Nuclear Transformations. J. B. Evans, J. E. Quinlan and J. E. Willard. *Ind. Eng. Chem. 50,* 192 (1958) Feb. (4 pp.)

Nuclear transformations can be used to introduce radioactive atoms into chemical compounds useful for tracer studies. Mixtures of extremely small amounts of high specific activity compounds are formed, the components of which may be separated and identified by gas chromatography. This method is compared with other labeling techniques.

Sulfur Determination

Determination of the Total Sulfur Content of Solid Fuels. W. Lange and P. Mohrhauer. *Brennstoff-Chemie 39,* 55 (1958) Feb. 12 (4 pp.)

Standard analytical methods for determination of sulfur content of solid fuels are a result of national and international endeavor. By parallel investigation of various standard procedures, it was proved that systematic errors are not attached to individual methods and determined values represent true sulfur content of the samples. Three methods were examined and the sum of the deviations of individual value from average value was determined for all solid fuels.

Rapid Quantitative Determination of Sulfur in Organic Compounds. I. Lysyj and J. F. Zarembo. *Anal. Chem. 30,* 428 (1958) Mar. (3 pp.)

Simple method for determination of sulfur in organic compounds uses Schöniger method of burning sample in oxygen-filled flask. After absorption of combustion products in 6% hydrogen peroxide, analysis is completed either by titration with sodium hydroxide or precipitation as barium sulfate. Precision of method is $\pm$ 1% using samples containing 5-10 mg of sulfur.

Surface Moisture

Measurement of Surface Moisture. P. J. Sereda. *ASTM Bulletin 228,* 53 (1958) Feb. (3 pp.)

Method for detecting presence of surface moisture on metal panels exposed to outdoor conditions involves varying the sensitivity of the element so that moisture caused by dew or snow at low temperature can be differentiated from gross moisture caused by rain. It is quite certain that the presence of SO_2 in the atmosphere can be detected by an increase in maximum potential.

Volatile Matter Determination

Automatic Unit for Determination of Volatile Matter in Coal, Coke, and Char. R. P. Hensel and S. A. Jones. *Anal. Chem. 30,* 402 (1958) Mar. (3 pp.)

Automatic mechanical lowering device has been developed for lowering crucible at uniform rate into hot furnace in ASTM method for volatile content of coal, coke or char. Apparatus allows close control of heating, is sufficiently flexible to be adapted to a variety of materials, and automatically controls entire operation.

X-ray Crystallography

Modifications to a Travelling Microscope Used for Measuring X-ray Powder Photographs. W. E. Armstrong and R. J. Davis. *J. Sci. Instruments 35,* 59 (1958) Feb. (3 pp.)

First step in adapting travelling microscope for

measuring powder photographs was removal of cross-hairs in the eyepiece which tend to obscure faint lines on the photograph and prevent measurement. Reference mark was obtained from a light spot thrown on photograph from a projector clamped to microscope's barrel. Light spot allows change of magnification for measuring different lines without moving reference mark, eliminates parallax and allows use of a binocular eyepiece.

Alcohol in Air

Apparatus for Analyzing a Gas. R. F. Borkenstein. U.S. 2,824,789 (1958) Feb. 25.

Alcohol or other reactive vapor content of air is determined by reacting a sample with a potassium dichromate solution, which is then compared with gas-free solution by measuring electrically the transmission of light of both.

13. BASIC SCIENCE

Acetylene

Heats of Hydrogenation. Part 2. Acetylene Derivatives. *Trans. of the Faraday Society 54,* 47 (1958) Jan. (7 pp.)

Heat of hydrogenation of a vinyl- or a phenyl-substituted acetylene is reduced relative to that of the parent hydrocarbon, the reduction being of similar magnitude to that resulting from vinyl or phenyl substitution into olefins. Substitution of —COOH, —COOMe or —$CONH_2$ into an acetylene leads to an increase in the heat of hydrogenation.

Adsorption Mechanisms

Apparatus for the Direct Measurement of Adsorption on Solid Surfaces from Liquids. J. A. Kaplan and H. C. Gatos. *Rev. Sci. Instruments 29,* 47 (1958) Jan. (4 pp.)

Technique applicable to very dilute solutions in which solute can be tagged with a γ- or hard β-emitting isotope. Adsorbed radioactivity of solid surface is determined through a continuously replenished thin layer of solution. Kinetics and equilibrium conditions of adsorption, desorption and exchange reactions can be determined conveniently; simultaneously, electrochemical behavior of surface can be studied. Some measurements are reported.

Distillation

New Paths in Sea-Water Distillation. A. E. Williams. *Chem. & Process Eng. 39,* 55 (1958) Feb. (4 pp.)

In the majority of sea-water distillation plants, evaporators can operate efficiently on low-pressure steam, such as is available from back-pressure or pass-out turbines. In other cases, waste heat from exhaust gases of diesel engines, oil refineries and steelworks waste heat may be harnessed to provide the low-pressure steam, or to heat evaporators directly. Whenever such waste heat is available, the distillation plant becomes an economical unit. Recent improvements have been made in these installations. Advantages of multiple-effect evaporators can be applied in land-based plants, but on board ship, evaporator is seldom more than a double effect. Vapor compression is especially economical when applied to marine installations.

Electrochemical Hydrogen Mechanisms

An Electrochemical Investigation of Hydrogen Producing Reactions Catalyzed by Nickel and Nickel-Palladium Cathodes. J. P. Hoare and S. Schuldiner. *J. Phys. Chem. 62,* 229 (1958) Feb. (5 pp.)

Hydrogen overvoltage measurements in acid solution of nickel, palladium and a series of nickel-palladium alloys were made. Hydrogen producing mechanisms are discussed. It was found that the steady-state, open-circuit potential values for palladium and the high palladium alloys which contained dissolved hydrogen were all positive to a Pt/H_2 electrode in the same solution. The nickel-palladium alloys containing between 32 and 99 atomic % nickel gave zero potential against a Pt/H_2 reference in the same solution. By use of nickel-palladium-hydrogen ternary alloys it is possible to vary the number of holes per atom in the d-band from about zero to 0.6. The relative catalytic activity of these metals for the hydrogen producing reaction is shown to be related to this number which in turn is determined by hydrogen solubility.

Fluid Flow

The Recording of Pressure Distributions in Porous Media during Fluid Flow Experiments. T. O'Donnell, D. H. Edwards, N. Collis-George and E. G. Youngs. *J. Sci. Instruments 35,* 63 (1958) Feb. (3 pp.)

Null-point method of recording in a short time interval distributions in a porous medium during fluid flow experiments. Small cells, buried at numerous points in porous material, measure pressure distribution which is recorded in a separate laboratory.

High Temperature Viscometry

The Experimental Determination of the Viscosity of Bases and Gas Mixtures at High Temperatures. V. Ya. Kompanects. *Sb. Nauch. Rabot. 9* (1953)

(14 pp.); *Ref. Zb. Mekh.* (1956) Rev. 6107; abstract from *Appl. Mech. Rev. 11,* 84 (1958) Feb.

A scheme is given with a detailed description of a viscometer with quartz capillary, specially designed to determine the viscosities of gases at high temperatures. The theory of the apparatus is propounded, and the solution of the working formulas for the coefficient of viscosity is given, it being assumed that the principle of the distribution of velocities in the capillary is of a parabolic nature, and that the difference of pressure measured in the experiment corresponds actually to the difference of pressure at the ends of the capillary. The error, due to the incomplete compliance with the accepted conditions, is evaluated. Three tables are given to indicate the values of the viscosity coefficients of air, CO_2 and H at different temperatures (up to 800°) which were obtained by the author using the described apparatus, and the values of the viscosity coefficients of the same gases as known from the literature. *Courtesy Referativnyi Zhurnal* N. A. Zaks, USSR *Translation, courtesy Ministry of Supply, England*

Hydrocarbon C_4 Rings

Far Ultraviolet Absorption Spectra of Small Ring Hydrocarbons. B. E. Loeffler, E. Eberlin and L. W. Pickett. *J. Chem. Phys. 28,* 345 (1958) Feb. (3 pp.)

Molar extinction coefficients for far ultraviolet absorption of cyclobutene, 1-methylcyclobutene and methylenecyclobutane were measured between 40,000 cm^{-1}-64,000cm^{-1}. These spectra show characteristic absorption of electrons with oscillator strengths of 0.3 and with band positions which are explicable on a molecular structure basis. Photodecomposition to give ethylene was observed in the case of methylenecyclobutane and 1-methylcyclobutene.

Hydrogenation Catalysts

Nickel, Copper and Some of Their Alloys as Catalysts for the Hydrogenation of Carbon Dioxide. L. E. Cratty, Jr. and W. W. Russell. *J. Am. Chem. Soc. 80,* 767 (1958) Feb. 20 (7 pp.)

X-ray diffraction and magnetic measurements indicate that, although nickel, copper and some of their alloys were prepared for these tests by reducing the oxides obtained from precipitated metal carbonates, they were essentially homogeneous, equilibrium solids. Alloying 11% or less of copper with nickel caused sharp parallel drops in both the magnetic susceptibility and in the power of the catalysts to hydrogenate carbon dioxide to methane rather than carbon monoxide. Alloys containing more than 50% copper behaved essentially like pure copper in that carbon monoxide but no methane was produced.

Mathematical Methods

Solve Second-Order Linear Equations. W. E. Ball and R. C. Johnson. *Chem. Eng. 65,* 145 (1958) Feb. 24 (6 pp.)

Applied problems demonstrate method of analyzing second-order equation to determine system performance. Use of symbolic operator simplifies mathematical manipulations.

Nuclear Process Heat

Let's Shift the Emphasis. G. F. Jenkins. *Chem. Eng. Progress 54,* 63 (1958) Feb. (3 pp.)

Need exists for shifting emphasis in nuclear energy field. Objective should be to derive greater advantages through savings and other benefits from the application of nuclear process to the production of heat for industrial processing, for industrial process reactions and for production of radiation end products which seem to have such tremendous potential for future of America's high-geared economy.

Nuclear Process Heat Reactors—Problems Large, Rewards Great. B. W. Gamson. *Chem. Eng. Progress 54,* 74 (1958) Feb. (5 pp.)

Large potential market exists for application of nuclear heat to process industries. Existing technology with minor modification could produce low pressure steam competitive with fossil fuel. Application of nuclear reactors to chemical and metallurgical processing involves a large number of problems, depending upon the specific system proposed. Designs will be compromises between the optimum nuclear, thermodynamic, metallurgical and size factors.

Pilot Plant Operations

Pilot Plant Development of a Polyethylene Process. M. R. Cines, G. H. Dale, E. W. Mellow and R. E. Weis. *Chem. Eng. Progress 54,* 95 (1958) Feb. (4 pp.)

Case history highlights of an accelerated pilot plant development program to commercialize a major new chemical process for polyethylene production. Process divides into three major steps, so three pilot groups were initially organized to develop reaction step, catalyst removal and polymer recovery. First unit of commercial plant began functioning in November 1956.

Pipeline Flow

Predicting Pressure Drop in Gas-Condensate Pipelines. A. L. Berry and B. L. Moreau. *Oil Gas J. 56,* 108 (1958) Feb. 17 (3 pp.)

Six main flow patterns, bubble, stratified, wave, slugging, annular and fog, have been recognized in two-phase flow. Empirical approach was used in study of operating data of 4-16 in. high pressure two-phase pipelines in U. S. and Canada to determine total pressure drop in gathering system. Calculations are performed in two steps.

Two-Phase Flow in Rough Tubes. D. Chisholm and A. D. K. Laird. *ASME Trans. 80,* 276 (1958) Feb. (11 pp.)

Data for pressure drop and saturation during flow of air-water mixtures in smooth and rough horizontal tubes. Improvements in the two-phase flow correlations for rough tubes are presented. Approximate empirical relationships developed using these improvements correlated the majority of data within 15%.

Polycyclic Hydrocarbons

The Synthesis of Some Hexa-, Hepta-, and Octacyclic Hydrocarbons Derived from Fluorene. G. Saint-Ruf and P. Jacquignon. *J. Chem. Soc.,* 48 (1958) Jan. (4 pp.)

Condensed polycyclic hydrocarbons containing fluorene and acenaphthene or pyrene nuclei have been prepared by cyclodehydration of the appropriate polycyclic arylidene-α-tetralones.

Radiant Cooling

Sensible vs Latent Heat Removal in Radiant Cooling. C. A. Mills. *Refrigerating Eng. 66,* 43 (1958) Mar. (6 pp.)

Paralleling rapidly developing interest in radiant cooling, this discussion details certain newer findings—findings which indicate a sharply significant difference in the nature and handling of problems of latent vs sensible heat in cooling of nonmetallic products.

Radiation Chemistry

Engineering Factors in Using Electrons in Chemical Processing. J. W. Ranftl. *Ind. Eng. Chem. 50,* 196 (1958) Feb. (3 pp.)

In the accelerating program for investigating effects of ionizing radiations on chemical materials, safety, power economy, penetration efficiencies and compact machines are being emphasized. Basic principles for using electron radiations are discussed.

Interaction of Beta Particles with Matter. R. H. Muller. *Ind. Eng. Chem. 50,* 205 (1958) Feb. (5 pp.)

Extensive research on the theory of action should uncover new industrial applications, but whatever is learned about beta particle interaction in the future will not invalidate current practice. Present successful industrial applications do not require a completely rigorous knowledge of this interaction.

The Role of Ions in the Radiation Induced Exchange of Hydrogen and Deuterium. S. O. Thompson and O. A. Schaeffer. *J. Am. Chem. Soc. 80,* 553 (1958) Feb. 5 (6 pp.)

Investigation of α-particle induced reaction expressed by over-all equation $H_2+D_2 \rightarrow HD$ shows that the reaction has a yield of 18,000 molecules for each ion pair at 100 mm pressure of hydrogen. Reaction is extremely sensitive to trace impurities so that the yield for pure hydrogen is probably higher. Addition of trace amounts of xenon or krypton markedly inhibits reaction, while moderate amounts of added argon, neon or helium have little effect. None of the rare gases influences thermal or petrochemical induced exchange, which is interpreted as due to an ion chain mechanism involving H_2^+ as the chain propagator.

Where We Stand in Radiation Processing. J. J. Martin. *Chem. Eng. Progress 54,* 66 (1958) Feb. (6 pp.)

Article is limited to some recent work in radiation chemical processing, but points out that considerable amount of other research is being conducted in areas considered, particularly in application of radiation to specific reactions. Some companies have installed their own radiation laboratories or are sponsoring programs at industrial research laboratories. It is not expected that radiation processing will be widely applied for some time because there is a fair amount of fundamental work that must first be done.

Radiation Heat Transfer

A Model Method for Determining Geometric Factors in Solid-to-Solid Radiation Heat Transfer. P. L. Tea, Jr. and H. D. Baker. *ASME Trans. 80,* 367 (1958) Feb. (6 pp.)

Presentation of model method using light for determination of geometric factors which must be known in order to utilize the Stefan-Boltzmann equation for heat transfer by solid-to-solid radiation. Model closely approximates a uniform, perfectly diffuse

plane source of any shape. Detector of radiation has negligible cosine error. Technique is highly suited to handle problems involving interreflections.

Raman Spectra

High Resolution Raman Spectroscopy of Gases. B. P. Stoicheff. *Can. J. Phys. 36,* 218 (1958) Feb. (14 pp.)

Vibrational Raman spectra of CS_2, $C^{12}O_2$ and $C^{13}O_2$, consisting of the strong Fermi diad ν_1, $2\nu_2$, were photographed with a 21 ft grating. In the spectrum of CS_2, 12 additional sharp Q branches were observed in the region of the diad; three are due to isotopic molecules and the remainder are "hot" bands. Rotational structure of strong ν_1 band also was obtained. These measurements together with infrared data are used to determine vibrational constants $^{\omega}i^{\circ}$ and ^{x}ik of CS_2.

Shock Wave Pyrolysis

Pyrolysis of Simple Hydrocarbons in Shock Waves. E. F. Greene, R. L. Taylor and W. L. Patterson, Jr. *J. Phys. Chem. 62,* 238 (1958) Feb. (7 pp.)

Shock waves have been used to produce rapid homogeneous heating in simple hydrocarbons (CH_4, C_2H_6, C_2H_4, C_2H_2 and C_6H_6) in a temperature range of 1600-2500°K. Pyrolysis products were condensed at the temperature of liquid nitrogen and analyzed by infrared and gas chromatographic methods. The results support Porter's acetylene mechanism for hydrocarbon pyrolysis and indicate that diacetylene is likely to be the first intermediate formed in the reaction of acetylene to form solid carbon and hydrogen.

Surface Area Determination

Precise Evaluation of Surface Area with Indirectly Calculated Dead Space. W. B. Loebenstein. *J. Research 60,* 105 (1958) Feb. (4 pp.)

Determination of surface area from nitrogen adsorption data obtained at low temperature by volumetric methods is subject to several errors. One error that becomes especially serious when the surface area is small is associated with calibration of dead space within helium. A statistical method of successive approximations has been developed for calculating dead space. The latter is obtained as that quantity necessary to yield the best agreement with the known isotherm equation. This procedure fixes the value of V_m (directly proportional to the surface area) and also provides an estimate of the experimental error associated with the over-all determinations.

Thermal Conductivity

Experimental Thermal Conductivities of the $N_2O_4 \rightleftarrows 2NO_2$ System. K. P. Coffin and C. O'Neal, Jr. *National Advisory Committee for Aeronautics T.N. 4209.* Cleveland: Lewis Flight Propulsion Laboratory, 1958 (Feb.) (Order from NACA, Washington, D.C.)

Thermal conductivity was measured by means of a hot-wire technique at temperatures between 20° and 215°C and pressures from ⅓-1 atm. Approximate values were obtained at pressures as low as 0.02 atm from 20°-80°C. Experimental values are in good agreement with values calculated so as to include effects of dissociation. Dissociation produces an order-of-magnitude increase in conductivity.

Water Supply

DeSalting Could Be Just Around a Corner. J. H. Collins. *Public Util. Fortnightly 61,* 374 Mar. 13. (4 pp.)

Interior Department engineers predict that in 10-15 years ocean brine and inland brackish waters may be freshened on a large scale. A "breakthrough" might come sooner. Industry will be the first customer, so utility and industrial engineers are advised to watch progress. A little government money has developed surprising results among private investigators.

Hydrogen Separation

Purification of Hydrogen Utilizing Hydrogen-Permeable Membranes. A. J. deRosset (assigned to Universal Oil Products Co.) U. S. 2,824,620 (1958) Feb. 25.

Thin foils of hydrogen-permeable metals of Group VIII or their alloys are deposited on a supporting matrix of porous sintered metal to form a pressure resistant membrane for use in separating hydrogen from its mixtures.

Thermal Diffusion

Thermal Diffusion Apparatus. D. Frazier (assigned to Standard Oil Co.) U. S. 2,824,647 (1958) Feb. 25.

Liquid or gaseous mixtures are separated into dissimilar components by thermal diffusion along vertical walls, one heated and the other cooled, which bound the annular space between concentric tubes, with an unimpeded ascending and descending flow of components into collecting chambers achieved by enlarging one end of the outer tube and reducing the diameter of the opposite end of the inner tube.

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